SCIENTIFIC AMERICAN

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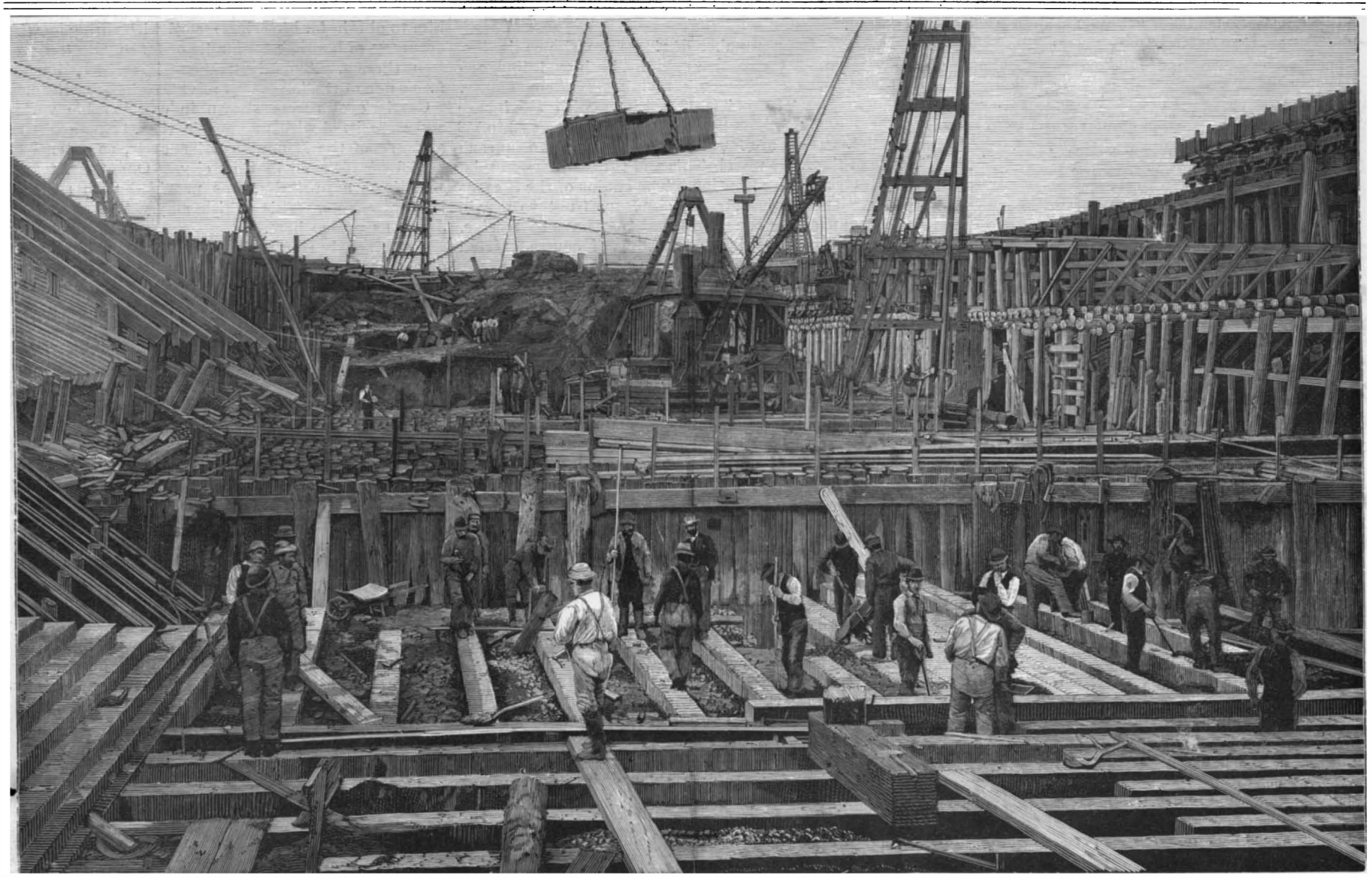
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXIV.—No. 5. ESTABLISHED 1845. NEW YORK, FEBRUARY 1, 1896. [$3.00 A YEAR. WEEKLY.



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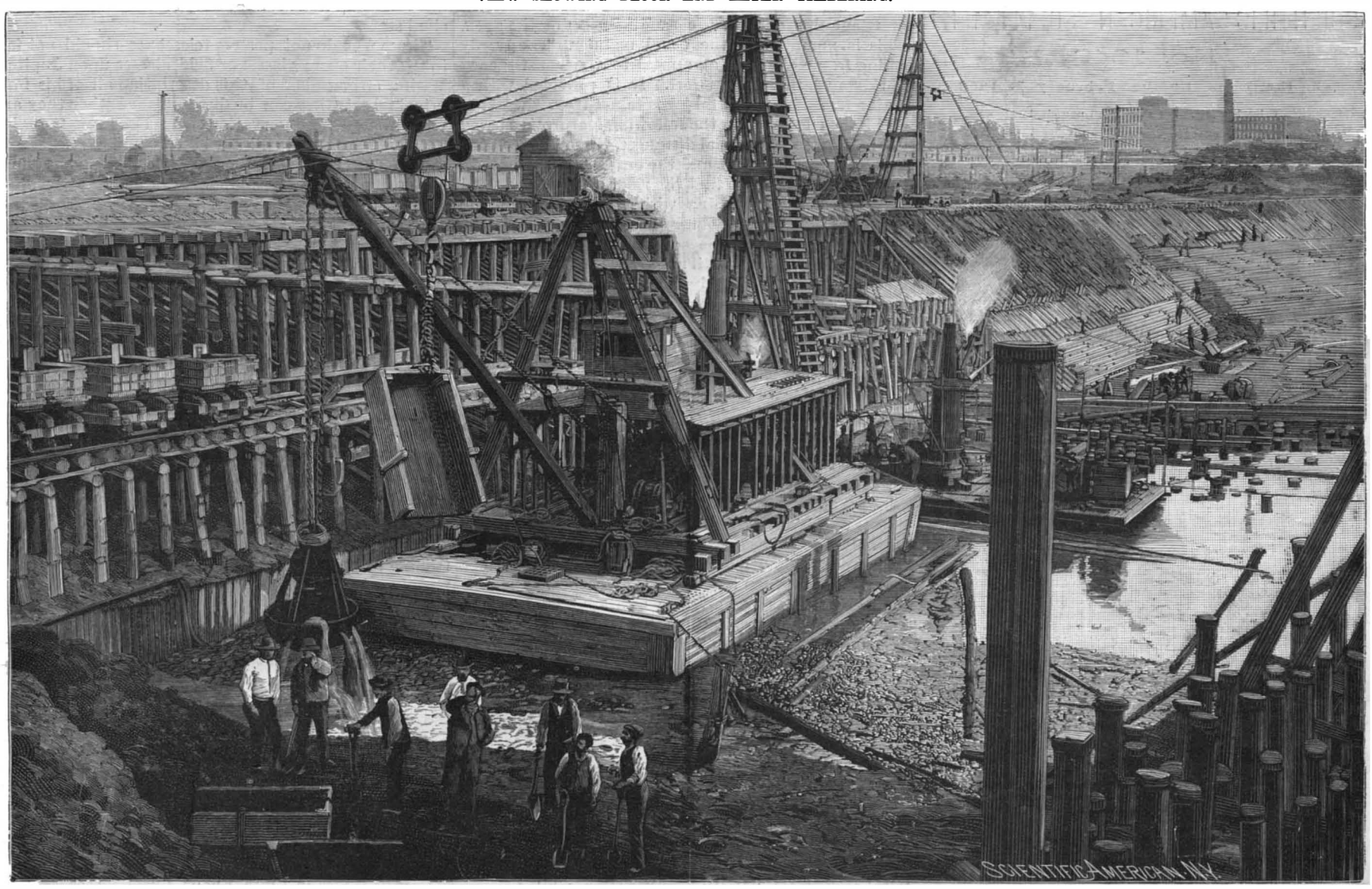

TIMBER DRY DOCK No. 3 AT UNITED STATES NAVY YARD, NEW YORK—VIEW OF OPERATIONS IN PROGRESS.—[See page 71.]

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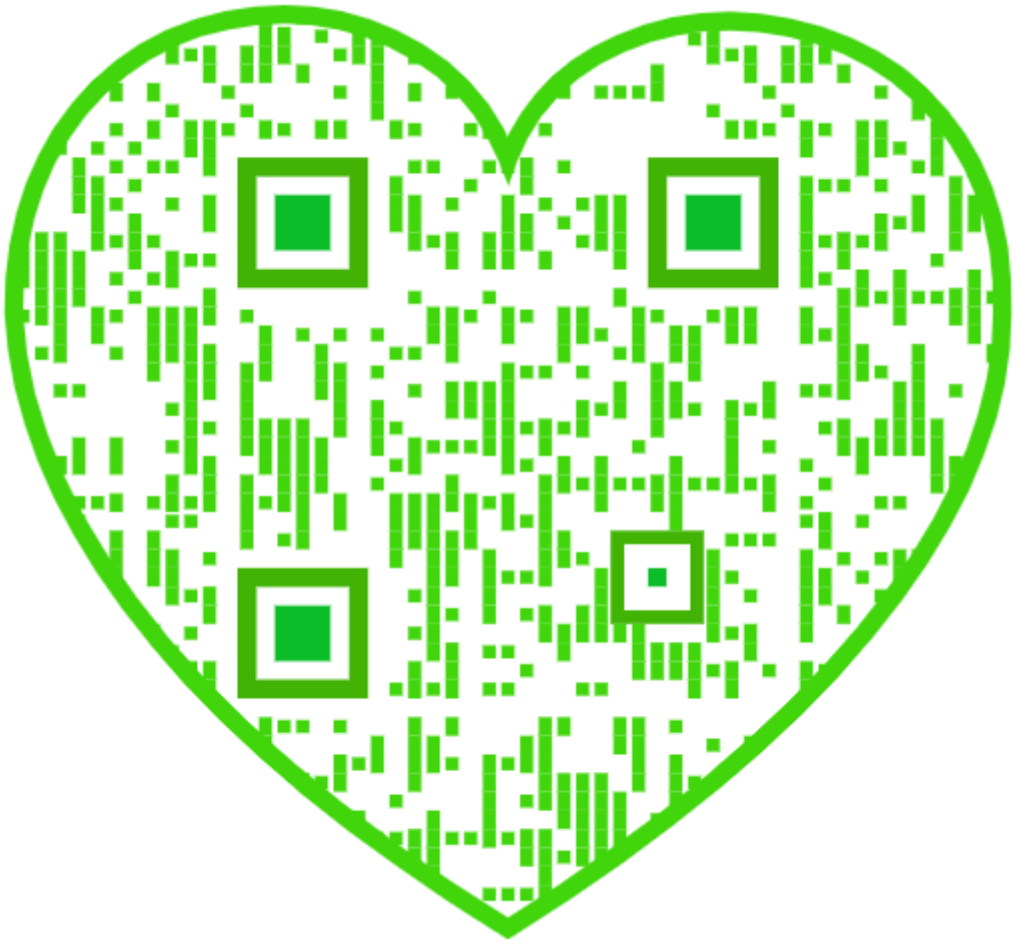

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

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One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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NEW YORK, SATURDAY, FEBRUARY 1, 1896.

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THE ANNUAL BICYCLE EXHIBITION AT THE MADISON SQUARE GARDEN, NEW YORK CITY.

As we go to press, the annual cycle exhibition under the auspices of the National Cycle Board of Trade has, with much eclat, come to a close. It opened January 18 and closed January 25. It would be impossible for us to attempt to describe all that was there, but the task is made easier by the fact that the 1896 bicycle has been built practically upon the lines of the 1895 wheel, and that the novelties shown there have, by force of circumstances, become sifted down to those presenting real points of merit, so that they are more interesting and fewer in number than hitherto, the age of so-called "freaks" in bicycles having, apparently, passed.

Wheels for a number of riders are shown in the Fowler and in the Stearns exhibits, both exhibits showing sextuplet wheels for carrying six riders at once. The Fowler "sextet" is 13 feet long with 125 inches wheel base; weighs 137½ pounds and is geared to 153 inches. There are four front fork sides, two on each side of the front wheel. This and the Stearns sextuplet attracted much attention. The chains of the Stearns sextuplet are graduated in size from front to rear in accordance with the stress that they have to receive, the powers of the six riders being, of course, exerted simultaneously on the last chain.

The frames, in general, are practically of the same construction as those of the past year, being almost universally of the diamond Humber type. Tubes of D-shaped cross section are used in the Singer wheels, which are of English construction, these having for the rear forks tubes of this section. It is not easy to see that much is gained thereby, although, of course, it is conducive to narrowness of tread.

The Wolff "Sociable" is a wheel that attracted considerable attention. It is a tricycle, adapted for two riders, seated side by side. This company and the Columbia Company show wheels adapted for army use. The "Sociable" is shown carrying a Maxim gun, the Columbia is shown with a Colt rapid firing gun. An army tandem is also shown by the Columbia Company, carrying two guns, a signal flag, and a complete outfit for two soldiers. Military men are now realizing that the bicycle will have its place in war, military science pressing into its service everything available.

Another exhibit attracting considerable attention is the so-called "Upright" wheel, a rear-driven safety with small front wheel and with handle bars carried around behind the rider, leaving the front unobstructed. The mounting is done from the front, and the position the rider assumes is perfectly upright, the handles coming on a line with his sides. The frame, approximating to the triangular shape, is very strong, and it is claimed that the bicycle can be made of exceedingly light weight. This is a concession to what might be termed the rational rider, one who desires to sit upright. The Owen bicycle has a somewhat similar frame of triangular outline, the saddle being at the apex. This is mounted in the usual manner. The Hardy spring frame bicycle is an appeal to the constituency of riders who desire comfort. It is provided with a spring frame by which all jar is taken from the rider, and in its construction the following feature is carried out: The three essential distances, those between the handle bars, the saddle and the crank bracket, are absolutely invariable, so that the rider on a rough road may be rising and falling with the spring, but the three critical distances never change.

Another feature in the construction of bicycles is shown by the Diebel center bearing used in the Fairmount cycle. This is a bearing for the crank shaft, which bearing is made to contain only a single row of balls, the necessary strength being given to it by making the diameter of the circle of balls large enough to insure a proper leverage; in this way a wheel is constructed with but three inches width of tread.

Several electric lamps are shown; one is equipped with a storage battery and there is supplied with it a dynamo to be run by water power to be taken from a house faucet. This will enable one to recharge his own battery. Some primary battery lamps are shown.

The majority of wheels are fitted with wooden rims, but the Eagle Company show their wheels fitted with aluminum rims of their own manufacture and of improved section, designed to make them stronger and more rigid than hitherto. One of the features of their exhibit was a wheel with unbrazed joints to be taken apart, in order to show the uninitiated the precise construction of the bicycle frame. As another innovation in wood, numerous examples of wooden handle bars appeared, and a bicycle was shown with wooden frame pieces in place of tubes.

Another very interesting exhibit was Jakobson's tandem attachment. By means of this attachment, the front wheel being removed from one bicycle, it can be fastened to another so as to produce a really practical three-wheeled tandem.

The repair of bicycle tires was exemplified in a number of ways, including vulcanizing apparatus for the more permanent repairing, apparatus both of the electrical and steam variety being shown, while various kinds of repair kits for the riders' use were exhibited. For those who travel with their wheels a great convenience in the shape of the Streat collapsible bicycle crate was shown. This crate is made of wood, with iron joints, to shut up into very small compass. It can be instantly opened to receive a bicycle. Those who have had the annoyance of crating their own wheels will appreciate the convenience that this presents.

Numerous cyclometers were shown, and among others an innovation in the shape of a chronodonometer or combined chronometer and cyclometer worked like a stop watch. The rider, without leaving his saddle, can start a special distance hand simultaneously with a time hand and can stop them again, thus enabling him to obtain for himself a record with chronometrical accuracy of his time for a mile or for any desired fraction thereof. This instrument is self-winding and forms one of the important advances to be noticed.

Carrier cycles were shown in considerable variety and were fitted with pneumatic tires, being a distinct advance of the London carrier cycle, so extensively used by tradesmen in that city. One type, termed sometimes a jinriksha, was provided with seats for two passengers. This vehicle may yet obtain fame in Japan as well as here.

Continuously ringing bells for attachment to the hub of a wheel were shown. Perhaps the most striking novelty in bells was the Bridgeport handle bar bell, which has already been shown in our columns. In it the metal cap at the end of the handle forms the bell, so that it is practically invisible, or rather indiscernible by the ordinary observer.

The weights of wheels are but slightly increased in the majority of cases. Some wheels use 1¼ inch tubing in place of the 1⅛ inch used last year. Tires in some cases are made slightly heavier. But to one who has grown fond of the American wheel, it is a real pleasure to find that the menace of heavier construction, which was taken as impending over the season of 1896, has passed harmlessly away, and we still can ride wheels ten to fifteen pounds lighter than those which obtain favor abroad.

THE FEBRUARY SKY.

BY GARRETT P. SERVISS.

Jupiter now reigns supreme in the starry heavens. Rising late in the afternoon at the beginning of February, by 8 or 9 o'clock in the evening the great planet is in an admirable position for observation. He is still in Cancer, forming a neat little triangle with the stars δ and γ. Just east of him glimmers the "Beehive" cluster. He is moving slowly westward, and in the course of the month will travel about three degrees toward the border of Gemini. At the close of February he will be some three degrees east of north from the remarkable triple star ζ Cancri, whose nearer components, being about one second of arc apart, form a convenient test for telescopes of moderate power. The more distant component is about 5½ seconds from the principal stars.

Those who do not possess telescopes should not fail to try their opera glasses or field glasses upon Jupiter. With a strong glass of this description all of his four principal satellites can be distinguished when they are well situated for observation. On February 3, for instance, about twenty minutes before midnight, Eastern standard time, three of the satellites will appear strung out on the west of the planet, while the fourth will be seen on the east. A similar, but even more favorable, arrangement of the satellites will occur at the same hour on the 17th. On the 24th, same hour, they will be quite symmetrically arranged, two on the west and two on the east. I have several times derived much satisfaction from the pleased surprise expressed by persons who, having no expectation of visiting an observatory, had not dreamed that they should ever see the moons of Jupiter with as slight an aid as that of an opera glass.

Venus and Mars are together in Sagittarius at the beginning of the month, rising some two hours ahead of the sun. Both are moving eastward, but Venus much more rapidly than the other, so that on the 9th she will pass Mars at a distance not much exceeding a degree and a half, Venus being on the north. By the end of the month she will have entered Capricorn, Mars remaining in Sagittarius. Those who take the trouble to rise early enough to see these planets in the morning sky will also behold the glorious spectacle of the Milky Way, which is nowhere more brilliant than in the region where Venus and Mars are now crossing it. Photographs and telescopic views show that the galaxy in this neighborhood is composed of a wonderfully intricate intermixture of star clusters, star fields, star clouds and nebulæ.

Saturn is in Libra, rising on the 1st of February soon after 1 A. M. and on the 29th about two hours earlier. The north pole of the planet now leans toward the earth, and the rings are widely opened. Splendid discoveries concerning this planet should mark the closing years of the nineteenth century, for Saturn has just begun to receive the attention it deserves in some of the great observatories.

Uranus is also in Libra, about five degrees east of

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Saturn, and Neptune is in Taurus, but, of course, invisible to the naked eye.

Mercury, having been in good position for observation as an evening star in the latter part of January, passes between the sun and the earth on February 8, and at the end of the month may be seen an hour before sunrise in the morning sky.

February opens, as January did, with a waning moon. She passes last quarter on February 5 and becomes new moon on the 13th. First quarter is reached on the 21st in Taurus and the full phase on the 28th in Leo.

The lunar conjunctions with the planets occur in the following order:

Saturn, February 6; Uranus, February 6; Mars, February 10; Venus, February 10; Mercury, February 12; Neptune, February 22; Jupiter, February 25.

On February 13, the South Pole, which is now enjoying its long summer day, will be shadowed by an annular eclipse of the sun, but the eclipse will not be visible anywhere in the northern hemisphere. A partial eclipse of the moon on February 28 will be seen in Europe, but not in this country.

The starry heavens are never more splendid than in the month of February. At 9 o'clock in the evening, at the middle of the month, the unrivaled Sirius, the Nile star of ancient Egypt, will be seen blazing high on the meridian, with Orion glittering toward the west and Gemini in midheaven. The jeweled arch of the Zodiac, springing from the western horizon, will brighten as it rises from Pisces, touching the hills with its stars, through Aries and Taurus, to the Twins shining near the zenith, while its downward sweep to the east will include Cancer, Leo and a part of Virgo. Crossing the middle of this magnificent belt of constellations, nearly at right angles, and touching the horizon north and south, will appear the starry laces of the Milky Way, encircling the sky with a band of celestial light. It is when wonder-opened eyes are lifted to such scenes as this that astronomers are born.

Obituary Notices.

John Allston Wilson, a well known civil engineer, died January 19, in West Philadelphia, at the age of 59 years. In the years 1857 and 1858 he served as topographer on the surveys made in Central America for the Honduras Interoceanic Railway. He entered the service of the Pennsylvania Railroad Company in 1861 and for a number of years was the chief engineer of that company. He was also connected since this time with many railroads.

Matthew B. Brady, the celebrated photographer, died in New York City, January 15. He was born in Warren County, N. Y., in 1823, and when a young man came to New York and opened a studio. In 1851 he entered his work in the exhibition in London and took first prize. His reputation grew until his photographs were known all over Europe. During the civil war, Mr. Brady placed a corps of artists in the field and obtained a famous collection of war studies, at an expense of more than $100,000. In the work of collecting more than 30,000 of these photographic plates Mr. Brady spent the greater part of his fortune, with the expectation that his collection would be purchased by the government; they did not, however, take all of them. For years after the war he maintained a studio in Washington and photographed the most celebrated men of the country. Mr. Brady lost most of his property and became nearly blind a few years ago.

Charles William Hewison died January 20. He was born in 1830 and early showed great inventive and constructive powers. In 1849 he acted as chief engineer on one of the Pacific Mail Line steamers. Shortly before the war broke out he met John Ericsson, the inventor of the Monitor. He made the principal engines of the Monitor and was chief engineer of one of the armored ships which went south at the beginning of the war. He had a large foundry and shop on the west side of New York, and it was there that he made the first phonograph for Thomas A. Edison. He was intimately associated with Captain Ericsson and constructed many models for him.

SOLDERS FOR GLASS.—Mr. Charles Margót finds that an alloy composed of ninety-five parts of tin and five of zinc melts at 200 degrees, and becomes firmly adherent to glass, and, moreover, is unalterable, and possesses a beautiful metallic luster; and, further, that an alloy composed of ninety parts of tin and ten of aluminum melts at 390 degrees, became strongly soldered to glass, and is possessed of a very stable brilliancy. With these two alloys it is possible, says the Pottery Gazette, to solder glass as easy as it is to solder two pieces of metal. It is possible to operate in two different manners. The two pieces of glass to be soldered can either be heated in a furnace and their surfaces be rubbed with a rod of the solder, when the alloy as it flows can be evenly distributed with a tampon of paper or a strip of aluminum, or an ordinary soldering iron can be used for melting the solder. In either case it only remains to unite the two pieces of glass and press them strongly against each other, and allow them to cool slowly.

Excavations in Cyprus.

The trustees of the British Museum, following up their excavations at Amathus in 1894, chose for their field of operation in 1895 the site of Curium, which General Cesnola's discoveries made famous a number of years ago. It was known that he had left certain spots untouched. These have now been explored under the direction of a Museum official, Mr. H. B. Walters. The results are exhibited temporarily in the European Saloon of the British Museum.

The ancient town of Curium was built on the summit of a rocky elevation some 300 feet above the sea, and was almost inaccessible on three sides. The rock is of calcareous sandstone, and has been cut on the east and south sides into a perpendicular face. The whole extent of this elevation is covered with the debris of buildings.

The tomb area is very extensive. Beginning with the rock-cut tombs, many hundreds of which are seen in the south wall of the Acropolis, long ago explored and emptied, tombs of all periods are found over the low-lying ground extending about half a mile south of the Acropolis, and in less numbers on the adjoining hill slopes.

But the special feature of the recent excavations was the discovery of a necropolis dating from what is called the Mycenæan period, and thus apparently confirming the statement of Strabo that Curium had originally been founded by a colony from Argos. It would seem that this cemetery, which lies on the side of a low hill to the east of the village of Episcopi, represents the site of the original Argive or Mycenæan foundation, and that the city had been transferred to the site now known as the Acropolis toward the end of the sixth century B.C., that being the date of the earliest tombs there.

In the Mycenæan tombs, along with pottery of the kind usually known by that name, was found a considerable quantity of rude and primitive pottery of local make, such as is found in Cypriote tombs of the pre-Phœnician period. These vases are hand-made, and decorated either with patterns in white or in relief on a dark ground, or with simple black patterns on a creamy ground. The Mycenæan vases are mostly of a character familiar from Dr. Schliemann's discoveries; but among them are also some specimens of remarkable rarity, in particular two large vases which belong to a class previously known only by four examples, found on pre-Phœnician sites in Cyprus and a fragment at Nauplia, in Greece. The method of decoration is purely Mycenæan, and the clay is probably of an imported kind; but the style of the figures is decidedly rude and betrays local influence. On both vases we have human figures in two-horse chariots, painted in black on a bright buff ground, and on one is a series of female figures in panels divided by borders—a style of decoration hitherto unknown. The field of each vase is covered with ornaments characteristic of this period.

Of vases of the Ialysos type we have a tall, elegant, two-handled cup, painted with cuttle fish, and a funnel-shaped vase decorated with murex shells. Another very remarkable and almost unique vase is of a shape known as pseudamphora, the mouth being covered up and a spout in the side used instead; this vase is decorated with an octopus on either side. In one tomb was found, along with two or three Mycenæan vases of the ordinary type, a sard scarab with Egyptian hieroglyphics, which has been pronounced by competent authorities to bear the name of Khonsu, a deity that was not introduced into Egypt until the twenty-sixth dynasty (666–527 B. C.); moreover, neither the shape nor the material of the gem is such as we are accustomed to associate with an earlier date than the seventh century B. C.

In another tomb a Phœnician cylinder was found with a design of a late conventionalized character, which cannot be dated earlier than 600 B. C., and with it were some gold ornaments of a common Mycenæan type. But incomparably the most important object in these finds is a small steatite scaraboid, on which is an intaglio design of a bull lying down. The work is very admirable, the drawing most masterly, recalling the famous Vaphio gold cups in the museum at Athens. From the shape of the stone and the technical skill employed it is evident that this gem must belong to a very advanced period of Mycenæan art, possibly as late as 700 B. C Other gems which may be mentioned are a scarab of Thothmes III, found in a tomb of recent date; a scaraboid with an ibex, and an archaic scaraboid gem set in a silver ring, representing Heracles running. In the later or sixth century Curium, one particular site proved to be rich in gold ornaments. It seems very probable that Cesnola's treasure was originally gathered for the most part on this site, and this opinion has been shared by other explorers subsequent to his time. Besides sundry finger rings, earrings, and similar ornaments, a fine pair of bronze bracelets plated with gold, ending in rams' heads, should be mentioned; also a gold chain necklace of very delicate workmanship. The only bronze object that calls for special mention was an archaic Greek statuette of a female figure, dating from the sixth century; it had formed part of an elaborate lamp stand. Among the vases found in the later tombs is a large hydria (pitcher) of black glazed ware, on which figures are painted in thick white, with details marked in yellow. Many vases with similar decoration, but of inferior execution, have been found in Southern Italy, and are supposed to have been made at Tarentum, but probably this vase may be claimed as of genuine Greek manufacture.

On the site of what appears to have been a temple to Demeter and Core was found a Greek inscription which has the peculiar interest of being written first in the ordinary Greek letters and next in the Cypriote syllabary or local alphabet, in which each sign represents not a single letter, but a syllable, e. g., the first word *Δήμητρι* is written da-ma-ti-ri, each two letters being represented by one character.

For the coming season it has been decided by the authorities of the Museum to try a new site, where it is hoped that further evidence may be obtained bearing on the early history of Cyprus.—The Architect and Contract Reporter.

Prof. Roentgen's Discovery.

Full reports of Prof. Roentgen's discovery have not yet reached us, and the accounts so far received do not greatly clarify the atmosphere surrounding his discovery. The effects are said to have been produced by Crookes tubes as the source of light or of ethereal disturbance. The active cause, whatever it is, it is said, was incapable of refraction, at least by an ordinary photographic lens. The discovery is described as having been made by accident. Prof. Roentgen was experimenting with a Crookes tube covered with cloth. Some sensitized paper lay near it, and the paper showed next day some streaks of coloration. This appearing mysterious, Prof. Roentgen repeated what he had done and traced the cause to the tube, and so went on to prove that he could get actinic effects from an active Crookes tube through a screen, generally made of organic matter, and one quite opaque to light, although one account says that the effect can be produced through a plate of aluminum over half an inch thick. Another statement is to the effect that the rays are not undulatory, but move forward in straight lines.

This statement suggests an attempt to draw an analogy between what goes on inside a Crookes tube with the molecules of extremely rarefied air therein and what is supposed to go on in the space between the tube and the sensitized surface. Nine examples of the photographs are said to be in Vienna, sent there from Wurzburg. The Crookes tube, it appears, is placed behind the object to be experimented with, and the photography thus appears as shadow photography, or a species of printing similar to contact printing. It appears probable that the discovery is one of theoretical importance in physics, but probably of no practical value as yet in photography.

It is also to be remarked that there may be less of novelty in the experiments than is generally supposed. It is not going too far to say that even the old time breath images produced by a coin lying on a mirror are recalled to the mind by the descriptions received. Then the electric images produced by an electric discharge through a coin and impinging upon a photographic plate, Sanford's experiment, have been cited. It has even been suggested that some analogy with Hertz's experiments may exist. He passed radiant energy due to long ether waves through pitch and other bodies quite opaque to short ether waves, such as produce light. There is no novelty in passing ether waves through an opaque organic screen; the difficulty is in getting any actinic effect out of such waves. It is conceivable that their period might be shortened, and this has been suggested as a possible explanation of the achievement.

Cross-eyed Headlights.

The New York, New Haven and Hartford Railway has just introduced what might be called a "cross-eyed" headlight on their Air Line Flier. This is the invention of Col. N. H. Heft. The single headlight, ordinarily used, shines directly ahead when the locomotive is turning a curve. The field or whatever is alongside of the track is illuminated, but the rails ahead are for the moment in perfect darkness. In the new system two headlights are used. They are set precisely as the eyes are set in a cross-eyed person. They are so arranged that each will throw light across the other's rays. With the two lights so set it makes no difference which way the curve turns, as one or the other of the headlights illuminates the pathway. These new headlights have been such a success that they will be supplied as soon as possible to all through fast night trains.

Fisheries Exhibition at Kiel.

An estimate will be submitted to Congress for $20,000 to enable the War Department to make a river and harbor exhibit, and also the Fish Commission to make an exhibit, at the International Fisheries Exhibition, to be held at Kiel, Germany, next February.

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THE BASSETT CURTAIN FIXTURE.

We illustrate on this page an excellent device for an adjustable and self-locking window curtain, which has been patented by Mr. F. H. Bassett, of Saranac Lake, N. Y., and is being manufactured and sold by The Holmes & Bassett Company of Waterbury, Conn.

Figs. 1 to 4 show the device as applied to railroad and street cars. Figs. 5 to 9 show the invention as applied to the windows of private dwellings, offices and public buildings.

It will be seen that, as applied to car windows, the curtain has a single adjustment, consisting of the unrolling of the curtain to any depth desired; and that, as applied to domestic or municipal buildings, it has a double adjustment; inasmuch as it can not only be unrolled to any point desired and securely locked at that point, but the whole curtain, as thus unrolled, is capable of being itself adjusted vertically to shelter whatever portion of the total window space may be desired.

A perfect window curtain should be simple in its mechanism. it should possess few parts, it should be strong enough to withstand the rough handling to which it is certain at times to be subjected, and lastly and most important of all, the locking device should be thoroughly secure and reliable.

It is claimed that the device herewith illustrated fully meets these requirements, and that this is the first time that the problem of self-locking has been worked out from the right point of view.

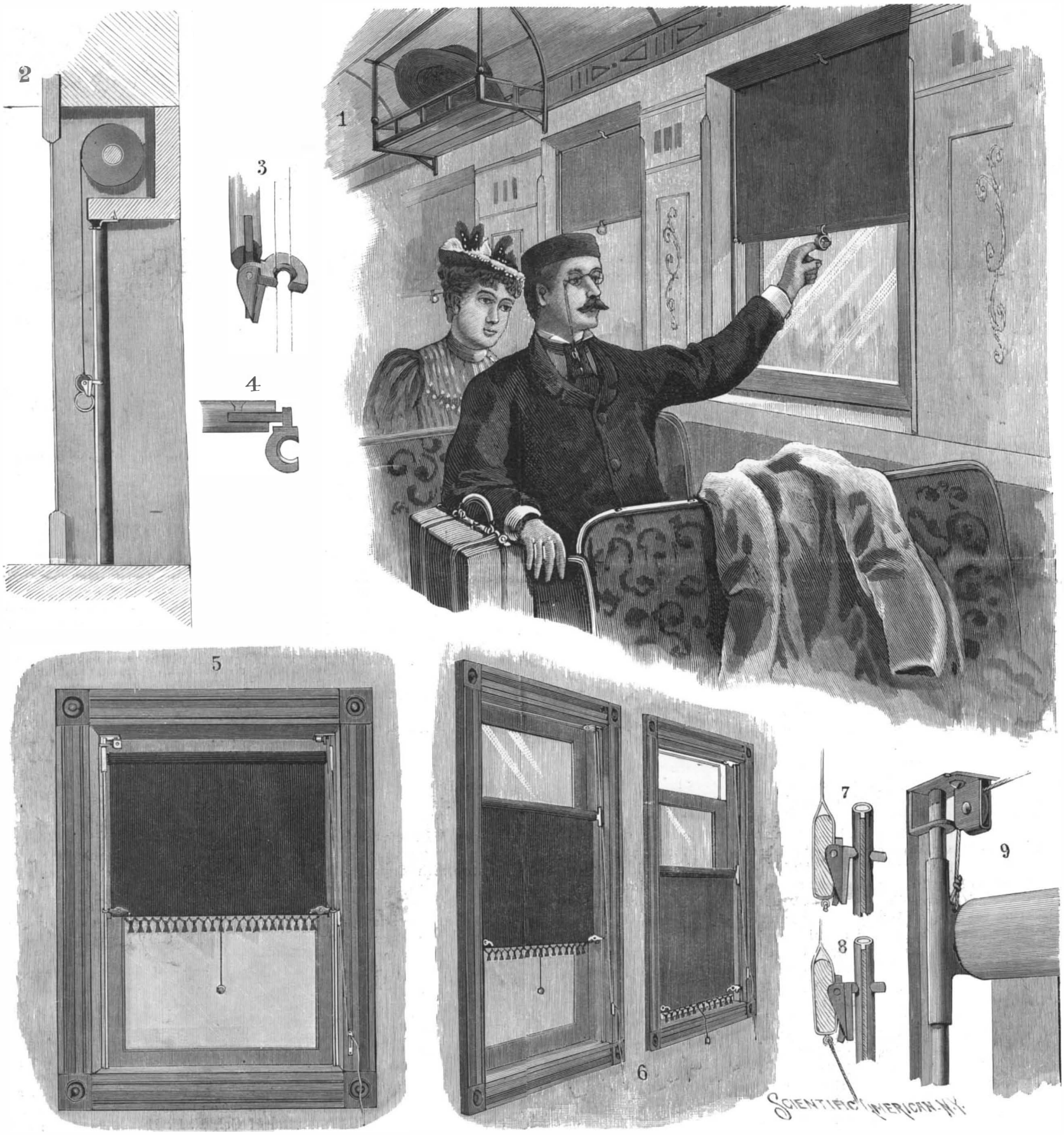
In the views, Fig. 1 shows the curtain as applied to the windows of a railroad car, Fig. 2 is a side elevation, showing the roller blind partially drawn down, the curtain rod with its clutches engaging the vertical guide rods; Figs. 3 and 4 are detail views of the clutches, showing the method of this attachment to the ends of the curtain rod.

In this invention, the curtain is provided with the customary coil spring on the roller, but the usual pawl and ratchet are wanting. In place of these a couple of pivoted clutches or jaws are provided, one at each end of the curtain rod, which engage and slide vertically upon two guides that are adjusted, one on each side of the curtain, against the sides of the window frame.

From the above description it will be seen that, since the pin on which the clutch is hung lies in the axis of the curtain rod, and the center of the jaws of said clutch is about half an inch horizontally from the pin under the vertical pull of the curtain, the sharp edges of the jaws will exercise a gripping or binding action on the guide rods, Figs. 3 and 7, and will serve to hold the curtain, and prevent it from rolling up. The harder the curtain is pulled vertically, the tighter the jaws will bite. Moreover, it is evident that the gripping action will take place immediately upon letting go of the curtain, and that to whatever depth the curtain be drawn, it will stay there. To release the curtain, it is only necessary to pull the ring that is attached at the middle of the rod, inward. This presses the vertical plate at the end of the curtain rod against the lower portion of the vertical part of the clutch, causing it to rotate and bring the jaws into a horizontal position as in Fig. 8. In this position the sharp inner edges of jaws cease to grip the guide rods, and the curtain rolls up. To take out the shade so that it may be dusted on both sides, it is only necessary to turn the button as shown at the top of the window frame and lift the curtain rod over the top of the guides, which for this purpose do not reach quite to the top of the frame.

In the second form of curtain, for use in residences, offices, etc., the roller, instead of being fastened on stationary brackets to the window frame, is hung upon two sleeves which themselves slide up in the before-mentioned guide rods, as shown in Fig. 9. The sleeves are held in position by two cords, which pass up and over two pulleys attached to the top of the window frame one on each side, as shown in Fig. 5. The two cords unite in a single cord on the right hand side of the curtain and are secured on a suitable belaying pin. If it is desired to shade only the lower half of the window, as in Fig. 6, the curtain is pulled down to full length, the cord that holds the roller is released, and under the action of the coil spring the curtain rolls down from above, the roller sliding down upon the guides by means of the sleeves above mentioned.

To adjust the shade from the bottom, the clutches are released by pulling the cord from the window as shown in Fig. 8, and the blind is rolled up by means of the spring roller to the desired position, where it will stop by letting go the cord; thus it will be seen that any space of the window may be shaded. In this curtain the plate which carries the clutches is secured to the flat curtain stick as shown in Figs. 5, 7 and 8.



THE BASSETT CURTAIN FIXTURE.

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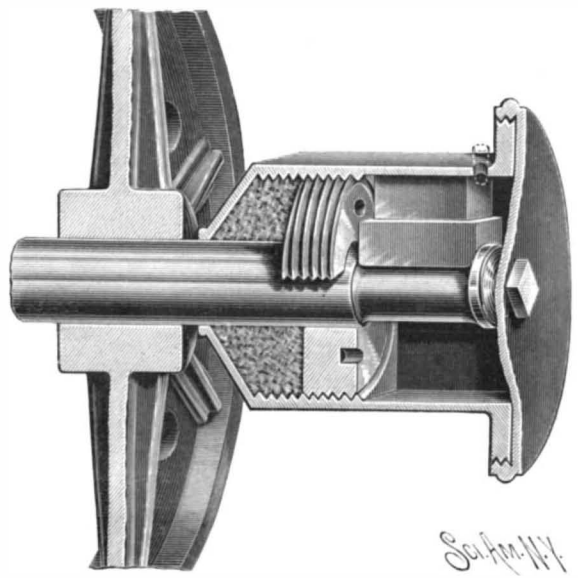
AN IMPROVED CAR AXLE BOX.

An axle box designed to absolutely prevent the entry of dirt and grit to the bearing parts, while facilitating their perfect lubrication with oil only, is shown in the accompanying illustration, and has been patented by Carolus Noyes, Jr., of Valley Falls, R. I. It has a circular, tapering inner portion, and a square outer portion, hermetically sealed by a screw cap or cover, the circular inner portion being threaded to receive a packing ring screw, which may be screwed against an oakum or other packing by a suitable tool. If convenient to facilitate the use of a packing ring of any desired shape, the thread may be dispensed with and



NOYES' CAR AXLE BOX.

the packing ring held in position and pressure given to it by extending rods from the ring to a similar ring resting against the cover of the box, when the screwing of the cover into position would give the same results. In the square portion of the box, on the neck of the axle, are two bearing blocks or brasses, the weight of the car coming upon the box directly over the blocks, and in the top of the box, at its outer end, is an opening for the introduction of the lubricant, which should be allowed to rise to a point above the concave bottom of the lower block, thus completely submerging the axle.

ELECTRIC FERRY BOATS.—Eight small electric ferry boats were put into service some time ago at Bergen, Norway, to replace the old inadequate rowboat system, and afford interesting evidence of the growing appreciations of electric motor possibilities. The boats are about 16 feet long, of 6½ feet beam, and 2½ feet draught, and have a displacement of about 6 tons. They are built symmetrically fore and aft, and are provided with a screw and rudder at each end. The screws are on a common shaft, direct coupled to the motor, which is series wound, weighs about 600 pounds, and is rated at three horse power. It is placed in the middle of the boat, under the flooring. The storage batteries are placed partly under the flooring and partly under the seats. The plates of each battery weigh about 3,000 pounds, and have a capacity of about 20,000 watt hours. The battery itself consists of 32 cells in series, and weighs altogether about 5,280 pounds. The average speed, with a power of 2,300 watts, is about five miles an hour. Each boat runs about 37½ miles a day, and about 1,800 passengers, on the average, have been carried by the ferry each day. After the day's work is over the boats return to the charging station, where the accumulators are charged during the night, and the necessary cleaning is done and repairs made. The charging station is fitted with a compound portable steam engine, a dynamo of 30 horse power, and a suitable switchboard. During eight months' run of uninterrupted operation the plant is said to have proved excellent in every respect.—Marine Record.

THE INGERSOLL CYCLOMETER.

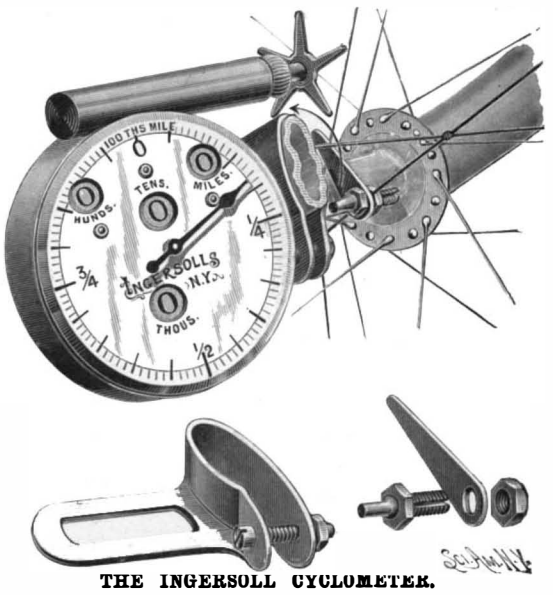
In old days the wheelman was willing to pay a very high price for a cyclometer, a necessity which no longer exists. We have prepared the accompanying illustration with a view to showing our readers one of the newest forms of cyclometers. It is made partly of aluminum, the wheels and dial being of that metal. It is attached by a clip to the fork side, so that the front wheel axle nut need not be disturbed, this being no slight improvement over the usual method of attachment. The striking pin also possesses a peculiar feature. It is a cylindrical pin ending in a split screw which straddles one of the spokes, and it is secured and adjusted for protection by two nuts, one on each side of the spoke. To prevent the pin from swiveling, a tongue is used which, inserted between the nearest spokes, prevents the possibility of its swinging around the spoke to which it is attached. The adjustability of the pin for length is a very great improvement, as wheels differ in proportion so greatly. The Ingersoll cyclometer registers up to 10,000 miles and is provided with a hand which, going one circuit of the dial for a mile, gives readings to 1-100 of a mile. The weight is 1¾ ounces. It is manufactured by Robert H. Ingersoll & Brother, 65 Cortlandt Street, New York City.

AN ELECTRIC WELDING MACHINE FOR USE ON BICYCLE FRAMES AND SIMILAR WORK.

We have from time to time published articles upon various systems of electric welding, especially when such work has been done in welding railroad rails. In the accompanying illustrations, for which we are indebted to London Engineering, we show apparatus adapted for use in smaller work, such as welding bicycle frames, steel pipes, etc. Our contemporary says:

This system is now being introduced by Mr. T. Scott Anderson, of the Royal Insurance Buildings, Sheffield. It is known as the Zerener system, and is founded on the well known phenomenon of the deflection of the electric arc by a magnet. The mutual action of an electric current and a magnet is, of course, the basis of dynamos, galvanometers, and of most forms of electric instruments, but the effect is nowhere so strikingly shown as when a powerful electromagnet is placed beside an arc playing between two carbon points. The arc is then driven outward until it resembles a blowpipe flame, and can be used as such, but with this difference, that the temperature is enormously higher. It will be readily imagined that with this flame some very difficult jobs in soldering, brazing, and welding can be attacked with much better prospects of success than if any other means are employed.

There are two forms of apparatus for applying the deflected arc, according to the size and power of the flame required. Fig. 1 shows the smaller form. The current passes from carbon to carbon, forming the arc, and the feed is arranged by means of a small thumb-spring. By means of the horseshoe electromagnet, the position of which is adjustable, the arc is deflected at will to any position, and the heat is thus spread over



THE INGERSOLL CYCLOMETER.

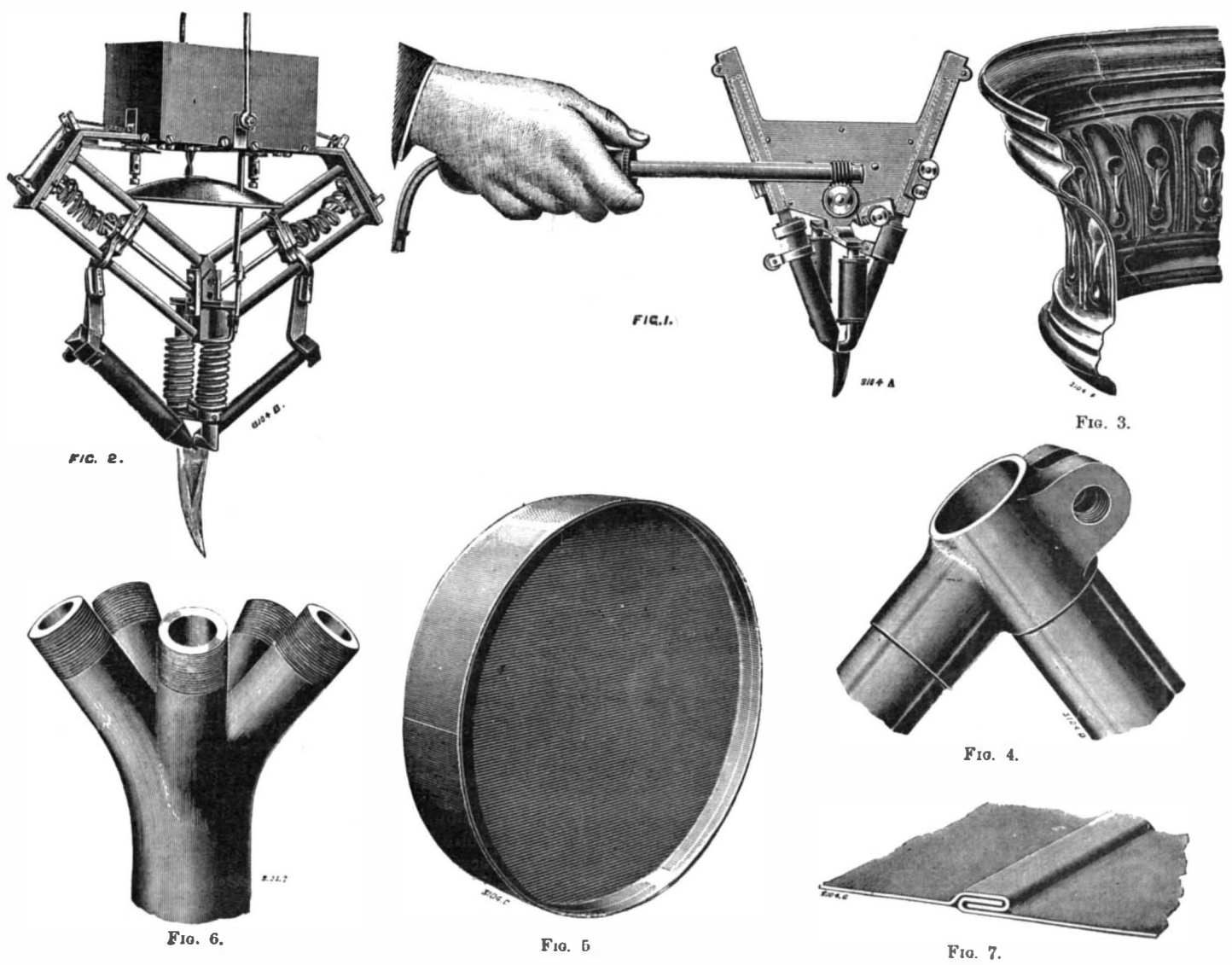
any desired area. One of the smallest of these plants, operated by one workman, and driven by a 5 indicated horse power engine, has made 2,000 brazes in a week of 54 hours, and Figs. 3 and 4 show specimens of the work thus done. Tubes of brass, copper, aluminum, steel, and iron have been thus brazed as brass to brass, copper to copper, or as copper to steel, brass to iron, etc.

A large number of trials have been successfully carried out to meet the requirements of the cycle trade, and two complete plants for this work are already in use. Fig. 4 shows a part of a bicycle frame.

In large work, the automatic apparatus is used (Fig. 2); the principle is precisely the same, but here an automatic arrangement is employed for feeding the carbons, and instead of the apparatus being held by the workman, it is suspended or placed in any position required. A considerable amount of work has been done by this large plant, which varies from 150 to 300 amperes output. Steel pipes from ⅛ inch to ½ inch thick have been longitudinally welded, the rate of work comparing favorably with the present system of riveting. Deck plates up to ⅝ inch thick have been satisfactorily welded, and a plant for this particular work, and also the ordinary requirements of a shipyard, is being erected.

Seam welding is probably the finest production of the deflected arc system; we have before us a sample weld in a plate $\frac{1}{16}$ inch thick, 34 inches long, and 8 inches wide, seam welded from top to bottom.

Fig. 5 shows the bottom brazed into a steel barrel. The joint, however, can be equally well welded with a slightly larger expenditure of current. These barrels are welded throughout, ends, longitud-



AN ELECTRIC WELDING MACHINE FOR USE ON BICYCLE FRAMES AND SIMILAR WORK.

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inal seam, and bung; the horse power required for this work is about 18 actual, and a steel barrel of 40 gallons capacity has been commenced and finished in just over one hour. Within the last few months two plants for barrel work, to turn out together some 300 per week, have been erected. Another application of the system is the production of hardened and tempered sections for reaping machines, the work being done by a slightly different machine. Fig. 6 shows a sample of pipe welding, and Fig. 7 a brazed joint.

For ordinary machine repairs, castings, boiler plates, locomotive shop works, etc., the system is equally suitable. The plant required for such operations is of a simple description; no accumulators are necessary, and where a lighting plant is installed of suitable output, the cost of accessories is not large. The portability of the apparatus is a great advantage; any work can be carried on in situ, and the extensive range of work possible by one plant should lead to very considerable application, more particularly where the ordinary methods of welding are impracticable.

Life in the Arctic Regions.

At a recent meeting of the Royal Geographical Society, Mr. A. Trevor-Battye lectured upon "The Struggle for Life in the North Polar Region."

Mr. Trevor-Battye said it struck all travelers in the Polar regions that instead of the dreary and barren lands which they might expect to see they found on the contrary abundant and exuberant life—mammals, birds, and plants flourishing in and apparently well content with the conditions of their existence. The fowler of our eastern coasts would recognize the sanderling, the knot, the brent goose, the ducks, and the waders which he was accustomed to shoot from his punt and he would find flowers such as those he had left behind—the dandelion, the cuckoo plant, and, further north, saxifrage. Much of the existence of the various forms of life was passed in sunlessness and extremely severe cold. An interesting question for naturalists was the consideration of this initial presence of organic life in those regions, and how it managed to survive. The question as to why the birds familiar to us in our temperate zone went north for the purpose of nesting was also one of great interest to naturalists. It seemed probable that the north was the original home of the progenitors of many of the species which annually migrate there, and that they retained the memory of their ancient birthplace. Darkness and cold were, of course, the two obstacles to life in the Arctic regions, but they were evidently not so formidable as might appear. It must be remembered that there was only a limited period of absolute darkness, and the fact that so many species of plants flourished in high latitudes was proof that sufficient light reached them. As to mammals, it was well known that the polar bear did not hibernate; he was not a martyr to the "chilly coma" which afflicted the black and brown bear and the dormouse, but roved the land and sea all the winter. Professor Geikie had said that the Polar region was the cradle for tree forms. The deciduous cypress, which is now found only in the United States and Mexico, flourished in the Miocene period as high up as latitude 82. The spruce also was a tree of the far north before it made its appearance in Europe.—Daily Graphic.

Electric Wires Killing Trees.

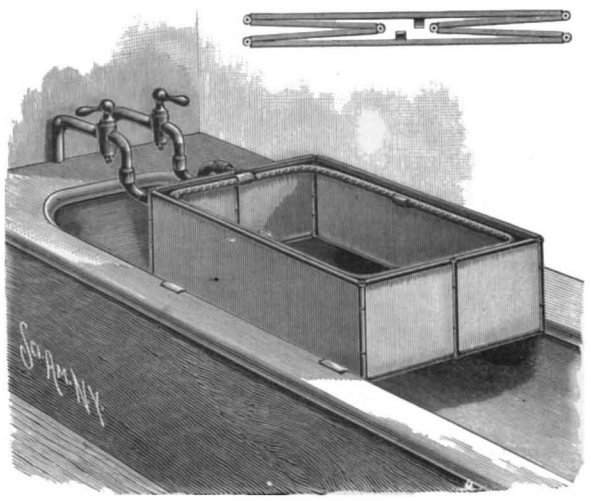
"In France," says Cosmos, "great care is taken in locating the wires that carry high tension electric currents, whether used for light or power, but in America the thing is done more simply. No one bothers himself about what is to be found at the side of the wire, and it passes among the branches of trees and across thickets, unconscious of the damage that it may do. Now in many towns it has been remarked that the trees crossed by the current dwindle and die. It has also been observed that the death of these trees invariably follows the rainy season; the leaves, being then soaked with moisture, become good conductors, and lead the current down into the tree from the wire. The wires, to be sure, have been insulated, but the protective layer has been quickly destroyed by the friction of the branches and the line becomes bare, producing thus results that it would have been well to avoid. And the electricity is the only thing that can be accused of this. It suffices, to convince one's self, to compare the condition of the trees traversed by the wires with that of neighboring trees. It has often been noticed that in a storm all the trees through which wires pass die in a few hours, while the surrounding ones are not touched. This is a very serious source of complaint, and causes some lawsuits."

W. I. Adams.

W. Irving Adams, of the Scovill & Adams Company, of New York City, died at his late residence in Montclair, N. J., January 2. Mr. Adams was president of the company. He had been identified with photography for thirty-five years, and was a writer for photographic journals, as well as the inventor of several improvements and photographic appliances.

A SHOWER OR NEEDLE BATH.

The convenient foldable attachment to an ordinary bath tub shown in the illustration has been patented by Warden R. Humphrey, of Wilmington, Del. It consists of a casing open at the top and bottom, along the sides and ends of which is a perforated pipe arranged to be connected by a hose with one or both faucets of the bath tub. The sides of the box or casing are connected by hinges with the ends, and the latter are made in two parts, connected by hinges, to permit folding, as shown in the small figure. In the box are lugs to support the perforated pipe, and the bath tub is also preferably provided with lugs to support the box in

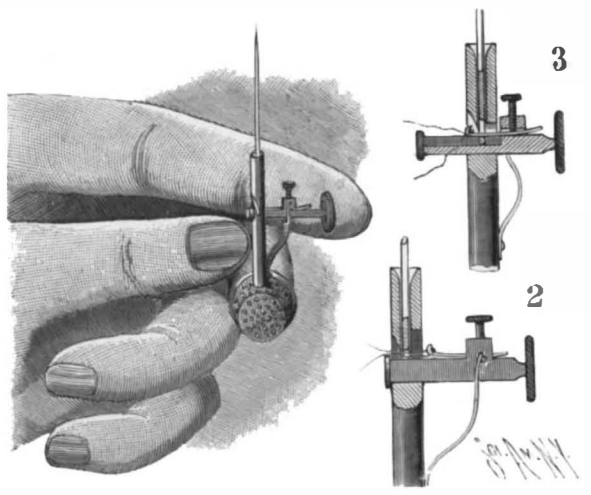


HUMPHREY'S SHOWER OR NEEDLE BATH.

proper position, when the bather, by raising and lowering himself in the box, can readily expose all parts of his body to the jets of water.

AN EFFICIENT NEEDLE THREADING DEVICE.

A device adapted for attachment to an ordinary thimble, to facilitate the easy threading of the needle without trying the eyes, is represented in the engraving, and forms the subject of a patent recently issued to T. A. Somdal, Mansfield, Ill. The device is attached to a thimble, as shown in the main view, by a threaded stem in its lower end engaging a small perforation in the end of the thimble, Fig. 2 showing the needle in place in the holder in position to be threaded, while Fig. 3 shows the thread-carrying hook passed through the eye of the needle in position to engage the thread. The lower end of the needle holder is slotted to receive a slide, on whose upper face is a groove adapted to form a seat for and to center the head of a needle inserted in the holder, there being on the outer end of the slide a thumbpiece. In an enlarged portion of the slide is also held, by means of a thumbscrew, a thread-carrying hook, arranged to be passed back and forth through the eye of the needle when the slide is reciprocated, the slide being normally held in withdrawn position by a spring. In the front side of the slide-receiving opening of the holder is a transverse slot, forming hooks at opposite sides of the passage to receive



SOMDAL'S NEEDLE THREADER.

and retain the thread with which the needle is to be threaded. When the needle is inserted in the holder, the groove in the slide turns the needle into proper position to permit the hook to pass through its eye as the slide is pushed inward, the withdrawal of the slide by the tension of the spring drawing also the thread engaged by the hook through the eye of the needle.

Royal Society Medals, 1895.

The Copley medal of the Royal Society for 1895 has been awarded to Prof. Karl Weierstrass, For. Mem. R.S., for his investigations in pure mathematics; a Royal medal to Prof. James Alfred Ewing, F.R.S., for his investigations on magnetic induction in iron and other metals: a Royal medal to Dr. John Murray, for his services to biological science and oceanography in connection with the Challenger reports, and for his original contributions to the same; and the Davy medal to Prof. William Ramsay, F.R.S., for his share in the discovery of argon, and for his discoveries regarding gaseous constituents of terrestrial minerals.

Annealing Wire by Electricity.

Stahl und Eisen describes a method of annealing wire by electricity, devised by Messrs. Lagrange & Hoho for the hand-drawn wire at the works of H. A. & W. Dresler, at Creuzthal, in Westphalia. The system adopted by Lagrange & Hoho of heating metals by the resistance to conductivity offered by an envelope of hydrogen produced by electrolysis consists of an electrolyzing tank containing a weak solution of salt in water, with a surface covering of petroleum. A plate of lead near the bottom of the tank, connected with the positive pole, forms the cathode, while the hard wire is guided through the tank parallel to the cathode by two insulated rollers immersed at about half the depth of the fluid. As it passes downward it relieves the current from the negative pole by a roller contact, similar to that of an overhead electric railway, and sets up decomposition in water, with an accumulation of hydrogen round it. This causes it to become red hot from increased resistance to the current; it is softened without becoming oxidized, as, on passing the second roller, it is cooled by the upper part of the bath and protecting cover of petroleum on the top. The tension of current is about 200 volts, and the operations of pickling and mashing are not necessary.

Antarctic Expeditions.

The extension of the whale and seal fishing industry seems to be an acknowledged fact. A syndicate has been formed in London for the purpose of sending out an expedition to the Antarctic with a view to carrying on whale and seal fishing, says the London Times. We are informed that all the capital necessary for the purpose has been obtained. It is proposed to send out two whaling steam vessels of 300 or 400 tons, and also one or more smaller steamboats. Mr. Borchgrevink, who last year accompanied the Antarctic to Victoria Land, is to have charge of a small scientific expedition which will be taken out in the ships. Mr. Borchgrevink has reason to hope that he will obtain the comparatively small sum necessary—£5,000. He would take with him eight or ten men qualified to carry on the work of scientific exploration and observation. The idea is that this party should be landed on Cape Adare or on Coulman Island still further south. From either point, Mr. Borchgrevink with two or three companions would make their way inland to the South Magnetic Pole. The headquarters of the scientific party would be Cape Adare, and here they would be left by the whaling ships, which would return for them in the following year. The expedition would leave England about August of next year.

If other syndicates that are talked of are successful, this will probably not be the only expedition to the south next year. We hear of an attempt to form a company in Leith, another expedition being arranged for in Hamburg, and still another in Norway. Then there is the American expedition in two tiny sailing ships, the leader of which, it is stated, hopes to bring home specimens of the strange people believed to inhabit a land whose climate has been calumniated. Still more hopeful is a project for a purely scientific expedition which is being arranged by a well-known gentleman in the North of England interested in natural history.

Counteracting Vibrations of Instruments.

A suspension for physical instruments free from the vibrations of the laboratory would be an inestimable boon to physicists, especially in crowded cities. At Leyden University, Professor Einthoven mounted his delicate capillary electrometer on an iron plate floating on mercury. This device was exceedingly successful, although somewhat cumbersome and bulky, and he was thus enabled to take a photographic record of the instrument magnified 800 times. Sir G. B. Airy was in the habit of placing his artificial horizon upon a table suspended by caoutchouc bands attached to another table similarly suspended, the arrangement being repeated three times. This, however, was even more cumbersome. Now Herr W. H. Julius, in Wiedemann's Annalen, describes a contrivance which is both simple and effective. It consists of a small circular table suspended by three vertical wires about 6 or 8 feet long, the ends of which form the points of an equilateral triangle. A movable weight is attached to a rod projecting downward from the center of the table. It can be clamped in any position, so as to bring the center of gravity of the table and the instrument into the plane of the table itself. Any lateral displacement of the upper ends of the wire will start waves down the wires, which will arrive at the table simultaneously, but will only affect it perceptibly when the period of the disturbance coincides with the period of oscillation of the table about the point of suspension. Even then the axis of the table is always strictly vertical. To clamp the oscillations peculiar to the suspension the author attached little vanes, dipping into oil or water, to the table. With a rough preliminary apparatus constructed in this manner, the author succeeded in reducing the vibrations to one tenth of their original amplitude.—Nature.

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THE TIMBER DRY DOCK NO. 3 AT THE NEW YORK NAVY YARD.

Much difficulty is encountered by the United States Navy Department in the matter of placing ships in dry dock, owing to the scarcity of docks long enough and deep enough to receive modern ships. While the typical war ship is not long enough to give any trouble in securing dockage, the question of sufficiency of depth of water over the sill at the entrance to the dock often arises. The ships of the American line may be required in time of war, and they represent a length of over 500 feet. There is need, therefore, for length and depth in our government dry docks, and we illustrate in our present issue work in progress on what is termed Dry Dock No. 3 of the New York Navy Yard. This structure is a timber dry dock, and in length and depth will be able to accommodate any ship afloat, while it will be able to receive two or three ordinary vessels at once.

The principal dimensions of the dock are as follows: Length at surface level from outer abutment to coping, 670 feet; length at bottom from outer abutment to lowest altar, 628 feet 8 inches. Width at surface level, 151 feet; width at bottom, 64 feet 4 inches.

The plan of the dock suggests the section of a wide mouth bottle. The entrance is closed by a floating caisson, which is a deep narrow steel boat, which when the dock is to be closed is placed directly across the opening, and bears against a projection or abutment placed in a vertical plane around the opening. There are two of these abutments, twenty feet apart, so that the dock compartment may vary to that extent in length. An India rubber packing is used between the caisson and abutment. The latter consists of heavy timbers which project twelve inches from the sides and bottom.

The sides of the dock slope evenly from top to bottom, and are lined with yellow pine timber laid as altars or steps. These timbers are 8 inches × 13 inches in section, and are laid so as to form steps of 8 inches rise and 10 inches tread. The slope is determined and they are supported by diagonal timbers or altar supports which are directly back of them and which lie in the vertical plane. These supports, which run from top to bottom of the slope, are carried by 12 inch piles, with seven piles for each length of slope. Each row of piles carries two altar supports which rest on shoulders on the piles, the reduced end of the pile forming a tenon and rising between the supports. Bolts are driven through the two timbers and the intermediate tenon.

From foot to foot of the sloping altar supports sill timbers run across the bottom of the dock, carried on the tops of piles, so that the three elements, right and left hand altar supports and sill timbers, give the cross section of the work. After these are in place the next operations are the flooring and putting on of the altars. The latter rest in notches, cut out of the altar supports with ax and adz. The notches are cut out of the diagonal forward edge of the timber, as each altar is ready for laying in position.

The graving dock represents a watertight basin from which water can be pumped. In the timber construction followed in the dock under consideration the dock is made watertight by sheet piling. On each side of the dock there are two rows of eight inch sheet piling, tongued and grooved and tied back by iron tie rods. One row of piling is driven along the foot of the slope of the sides, the other row is 62 feet back of it, this distance bringing it 26 feet back of the curb line of the dock. There are also several transverse courses of sheet piling of 8 inches and 6 inches thickness, to act as stop-waters and hold back any leakage from the bay.

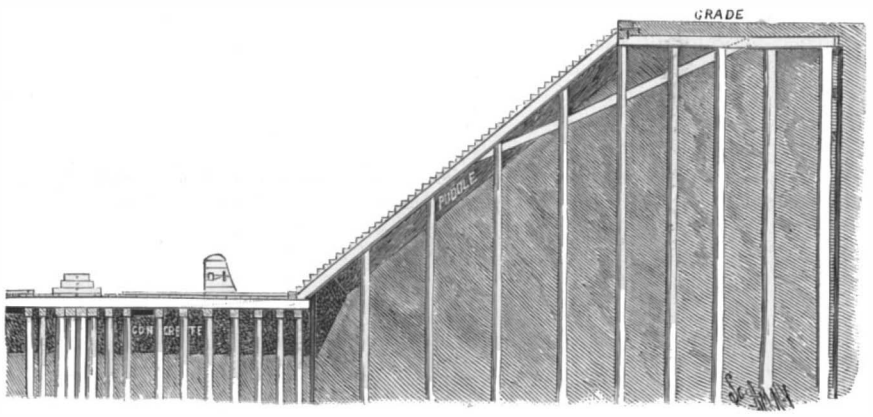
Taking the middle cross section, there are in it 52 piles. These are variously spaced; 6 feet 6 inches from center to center is the spacing of the piles under the surface back of the dock. The piles under the altar supports are 3 feet from center to center, and the piles to carry the floor timbers are spaced 3 feet 8 inches from center to center, except along the axis, where eight piles are driven close together. Over this axial group come the keel blocks. For the complete section there are 52 piles, mostly of 12 inch spruce.

Two diagonal braces are used on each side to brace together the side piling.

The total figures of quantities are impressive in the case of this dock. The timber is calculated at over 3,000,000 of board timber and the iron fastenings aggregate about 637,871 lb. There are upward of ten thousand piles, including 280 oak piles, in the structure irrespective of those employed temporarily. The excavation is calculated at 163,566 cubic yards.

The work has been started from the inner end, the excavation being carried out toward the old stone bulkhead which comes between it and the waters of the bay. The dock for a portion of its length is completed. Ultimately, a section of the bulkhead will have to come down to give space for the entrance. To further illustrate the construction of this dock we reproduce from a former issue the cross section of the other timber dock in the same navy yard, Dry Dock No. 2. While varying in details, the construction is so much alike that this section will be of use in explaining our description. The large cuts show the operations of construction in active progress. In the upper one are seen the floor timbers and to the left the altars and further back the altar supports. The lower cut shows in the background the long series of sloping altar supports with the lower altars in position. The piling for the altar supports is seen in the foreground also.

Underneath the floor of the dock is a bed of concrete three feet thick, while a two foot layer of puddle is worked in back of the altars as they are put in position.



CROSS SECTION OF A TIMBER DRY DOCK.

The Early Rising Precept.

Whatever may be your fad, it is certain sooner or later to receive the approval and support of the medical journals. From time to time they have discovered death in the milk jug, death in the teapot, death in wine, beer, tobacco, cycling, cricket, football, bathing and what not. The condemnation of the oyster was a heavy blow, and now we are asked to repudiate the principle of early rising. Speaking as one having authority and not as the scribes, the British Medical Journal makes bold to say that the early rising theory is a mistake, that the vital forces do not come fully into play until midday, and that the desire to get up with the lark, so far from being a sign of strength of character and vigor of body, denotes advancing age.

Such a doctrine is nothing short of revolutionary. It not only throws cold water upon the claims of the early risers, but by a parity of reasoning it extols that numerous class, the lazy lie-abed, who, we are now given to understand, are the salt of the earth. Frankly speaking, while inclined to rejoice at the snub administered to the early risers, I am unable to agree with the British Medical Journal. I wish I could, but all the scientific evidence seems to point to the early riser, or, let me say, the short sleeper, as the coming man.

Primitive man, like monkeys and birds, having no artificial light, must have gone to bed at nightfall, to sleep until sunrise; there was nothing else for him to do. Down to the last century civilization exhibited little change in this respect, all modes of artificial lighting being so poor that there was no inducement for anybody to turn night into day. The electric light, however, may conceivably enough make many independent of the light of day for the carrying on of business. In such an event the fittest type of man will surely be he who can keep awake longest, and get through the most work in twenty-four hours. I believe that the philosophy of "early to bed and early to rise" is a survival of the old conditions. "Work while yet it is day," says another authority, "for the night cometh when no man can work." That was a rash assertion. It could not have been enunciated at the end of the nineteenth century. A very great deal of the labor is done by night and the practice is sure to extend. This being so, all the twenty-four hours, in fact, being now available for work, the man who wants a long sleep rather than a short one will assuredly be at a disadvantage in the struggle for life. If the Darwinian theory is true, therefore, he will tend to die out—i. e., to be replaced by a more active organization adapted to the new conditions.—Pall Mall Budget.

Mexican International Exposition.

Under an act of the Federal Congress of Mexico, granted on January 9, 1895, the Mexican government has authorized an International Exposition to be opened in the city of Mexico on September 15, 1896, which it is hoped will embrace a representation of manufactured products from all parts of the world. For the convenience of manufacturers the Mexican International Exposition has opened an office in New York at No. 45 Broadway, Aldrich Court, the managers of which will be prepared to answer all inquiries which may be sent them as to space, terms and conditions.

Blenheim Palace and Estates.

Interest is attached to this palace and the Marlborough estates from the fact that they have been presided over by two American women, Mrs. Hamersley marrying the late duke and father of the present encumbent, whose marriage in this city attracted so much attention a few weeks ago.

So many misstatements have appeared in the public press with reference to Blenheim Palace, its condition and the outlay made upon it during the ten years from 1883 to 1893, and the sources from which such outlay has been provided, that the Duke of Marlborough has caused an investigation to be made into the accounts by a chartered public accountant, who reports to his grace that the sale of the Sutherland library, and such of the Blenheim pictures, enamels and china as were sold, produced the sum of £316,746 19s.

In the events which happened, says the Architect and Contract Reporter (London), the late Duke of Marlborough was entitled to the income of this sum as tenant for life under the Blenheim settlement, but the present Duke of Marlborough became absolutely entitled to the whole of the capital upon attaining the age of twenty-one. This sum was expended by the trustees, under the authority of orders of the Land Commissioners and the Court of Chancery, in the following manner:

There was laid out upon the erection and improvement of existing farm buildings and other houses and land passing under the settlement the sum of £78,978 19s. 4d. Freehold and other properties were purchased in the City of London—and now form part of the Duke of Marlborough's estate—at a cost of £152,312 15s. 2d. The portions of the late duke's sisters which were charged on the estates, and had to be raised and paid, absorbed £22,666 13s. 4d. There was laid out upon Blenheim Palace itself and upon the gardens, under the provisions of the Limited Owners' Residence Acts, the sum of £35,440 15s. 9d. Such outlay included the construction of new oak windows throughout the building, the renewing of the lead to the roof of the palace, the laying of parquetry in the different rooms of the palace, the construction of fire mains and appliances, the improvement of many of the rooms within the palace, the alterations and improvements in the porters' lodges and gateways, the erection of a new house for the gardener, the provision of new hot water apparatus and boilers in the palace, the provision of the whole of the greenhouses and forcing houses in the gardens, the entire reconstruction of the estate offices, the reconstruction of the whole of the locks within the palace and park, the reconstruction of the stables, of the palace gas works, of the roads round the palace itself, of the supply of entirely new grates and chimney pieces in the reception rooms of the palace, the reconstruction of the engine house and the engineer's cottage, the provision of new elevators within the palace, the entire renewal of all the fittings in the chapel, the provision of new fences round all the lodges and the reconstruction of the clock tower.

The entire installation of the electric light for the palace was, by an order of the Court of Chancery, dated October 31, 1888, handed over by the late duke to the trustees in exchange for certain heirloom furniture which the late duke acquired for his own private property under the provisions of the order. Thus the whole of the improvements, both to the palace and the gardens and to all the buildings and other portions of the settled estate, were, as a fact, paid for out of moneys the property of the present Duke of Marlborough, and from no other source whatever.

A California Exposition in New York.

Soon after the bicycle show closes in Madison Square Garden, New York, an exhibition will be held in character somewhat like the Crystal Palace Exhibition of 1853. It is to be controlled by a stock company composed of some of the largest shippers and producers of California and the East. The exhibition will include specimens of the best known products of California, as well as models of the '49 mining camp, a hydraulic mine, an electric gold mine, a quicksilver mine, a lumber camp, sawmills, sections of mammoth trees, a mountain road, the Lick telescope, etc., with models of Los Angeles, San Jose, Golden Gate Park, Oakland, Monterey, the Leland Stanford University, Spanish missions, ranches, adobe houses, and to crown all, there will be a wine cascade of California claret falling over crystal rocks. This cascade will be 25 feet high and 25 feet wide. This wine cascade will be lighted by electric lights, both above and behind the falls, in such a manner to be visible from the entrance of the garden. The mineral, fruit and flower display will be most effective and various stage performances will also be given.

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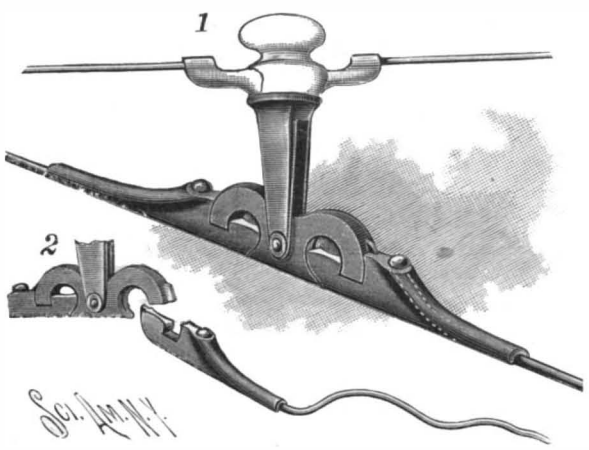
TROLLEY HANGER AND CUT-OUT.

The illustration represents a new and safe trolley hanger, which has been patented by Theodore Fletcher, of 1028 San Fernando St., San Antonio, Tex. The device will recommend itself as entirely doing away with the danger of the present overhead systems for electric cars at a trifling cost. It has been in use in San Antonio for some months, and is very strongly recommended for general adoption by those who have used

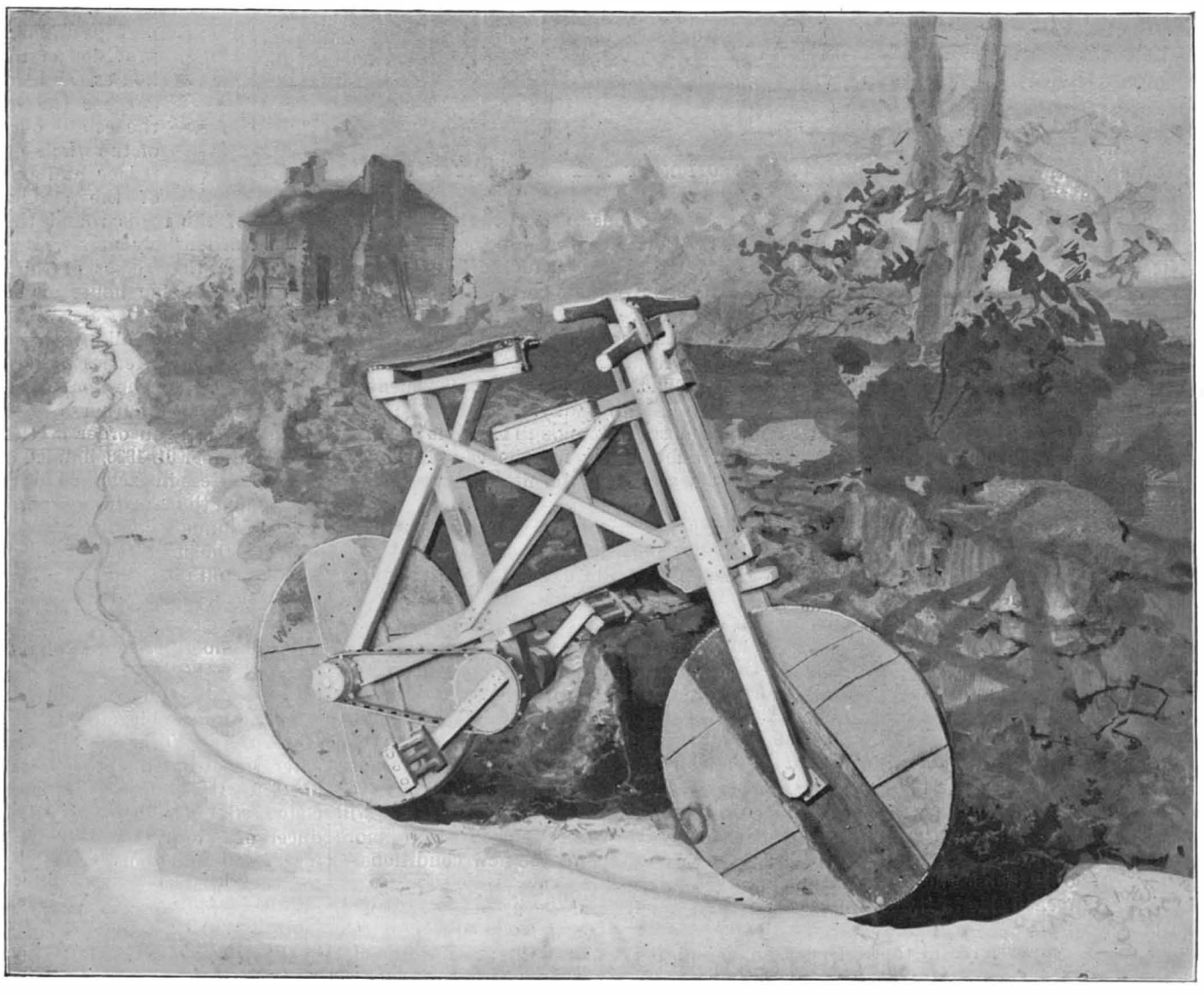


FLETCHER'S TROLLEY HANGER AND CUT-OUT.

it. The invention consists of a hanger made in sections coupled together and adapted to automatically uncouple as soon as the live wires break between adjacent hangers. Its operation is as follows: As soon as the trolley wire breaks, the broken ends sag and so disconnect at the adjacent hangers, permitting the broken section to fall, so that a live wire on the streets becomes a thing of the past. Furthermore, as the line does not become grounded, a block in the traffic can be avoided, for a car has only to get up a little momentum to carry it through the broken section. Fig. 1 shows the hanger supporting the wire, while Fig. 2 shows how the release of the broken end is effected. The hanger is simple, strong, quickly put up, and is designed to afford complete protection against accidents caused by a broken trolley wire.

A TWENTY-FIVE CENT BICYCLE.

Among the numerous bicycles which it has been our fortune to present to our readers in this era of the wheel, it is questionable if any has been shown which is more novel than the one illustrated here. This wheel was bought in the market from the manufacturer for 25 cents. This was no chance find, it was not an old curiosity from a lumber room, but was a genuine new wheel made for sale at the price of 25 cents. The cut, which is an exact reproduction of the machine, tells its own story. It is built of strips of wood and of boards, is fitted with brake, tool box, and it has an adjustable leather saddle, the latter having a stretching or tension screw to take up the sag of the leather. It was sold without driving gear, so it was fitted by one of the SCIENTIFIC AMERICAN staff with sprocket wheels and cranks, and with a perforated leather belt in place of a chain. Thus equipped, it proved ridable, not exactly equal in comfort, easy running, and speed to an 18 or 20 pound modern wheel; but it was ridden up and down the SCIENTIFIC AMERICAN office. Its construction does not conduce to the maintenance of a straight track, and our artist has been guided by experience in depicting its somewhat serpentine line of progress.



A TWENTY-FIVE CENT BICYCLE.

The wheel is constructed by Fred Dodson, a boy of fourteen years, who resides at Fishing Creek, Columbia County, Pa., and who manufactures the wheels for his own amusement. They are very ingeniously and strongly made, and are very creditable, considering the low price. Mr. Dodson will furnish the wheel complete, with pedals, driving chain, etc., but of course this increases the expense somewhat. This is the only wheel on the market whose tire surface is non-destructible.

A Rustless Coating.

By forming on the surface of iron and steel a double carbide of hydrogen and iron, which is extremely hard and adhesive, protection of the metal from rusting is said to be insured. This is a French process, and the treatment is effected in a pair of gas retorts, set side by side, and raised to a temperature of from 600 to 700 degrees Cent. The articles in this case are placed in a retort for about twenty minutes, when a current of hydrogen is turned into the retort and kept on for 45 minutes, a small quantity of naphtha being now introduced, the supply of which is kept on for 10 minutes. After this the naphtha is shut off, a current of hydrogen is turned on for fifteen minutes longer, when the process is finished. All that remains is to cool the retorts down to 400 degrees Cent., and as soon as this temperature is reached, the retort lids may be taken off and the product removed. The coating thus produced has a bluish color, and is stated to be so adherent to the metal that a treated bar can be bent through an angle of 45 degrees without disturbing it.—Railway Review.

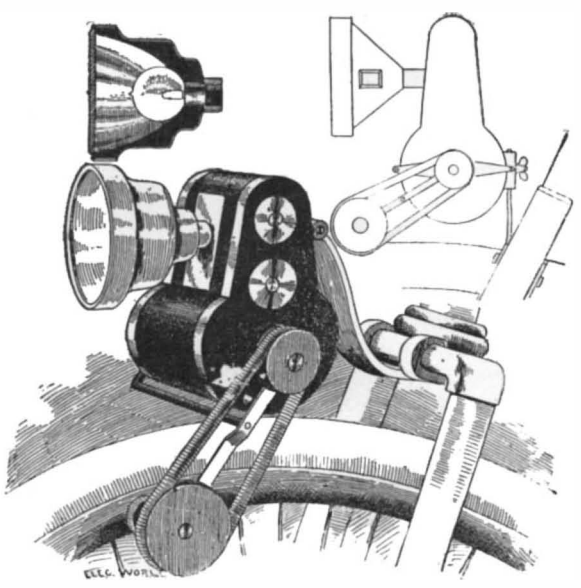
The Difference.

We came across the following lines the other day. They amused the writer and ended in an advertisement which we leave as it appeared in the original, as the advertisement is so cleverly drawn as to be worthy of its own reward.

"Tennyson could take a worthless sheet of paper, write a poem on it and make it worth $65,000—that's genius. Vanderbilt can write a few words on a sheet of paper and make it worth $5,000,000—that's capital. The United States can take an ounce and a quarter of gold and stamp upon it an "Eagle Bird" and make it worth $20—that's money. A mechanic can take material worth $5 and make it into watch springs worth $1,000—that's skill. A merchant can take an article worth 75 cents and sell it for $1—that's business. A lady can purchase a 75 cent hat, but she prefers one that costs $27—that's foolishness. A ditch digger works ten hours a day and handles several tons of earth for $3—that's labor. The printer of this could write a check for $80,000,000, but it wouldn't be worth a dime—that's rough. Any one can go to see Robert Hilliard and his clever company in 'Lost—24 Hours,' and thoroughly enjoy an excellent performance of one of the brightest comedies ever written—that's common sense."

AN ELECTRIC BICYCLE LAMP.

A unique bicycle lamp was recently illustrated in the Electrical World. A small magneto-electric machine, operated by a friction and band wheel, as shown, furnishes current for a miniature incandescent lamp. The little magneto has a shuttle armature, the core of which is thoroughly laminated. No commutator is used, but the current is collected from the frame of the machine, one terminal being grounded,



AN ELECTRIC BICYCLE LAMP.

and from one of the bearings which surrounds a slip ring on the shaft. Thus the construction is of the simplest. The alternating current is carried to a low voltage, two candle power lamp, which is inclosed in a reflector of an ingenious pattern. It is a double parabola and concentrates the light at the focus of the outer parabola, from which it is thrown forward in a remarkably powerful beam, which will furnish illumination for quite a distance ahead. The slightest rotation of the bicycle wheel causes the lamp to glow. Indeed, it would be difficult to ride the wheel slowly enough to maintain equilibrium and not have light. The lamp has a short, stumpy filament, and is therefore not liable to break from any cause except excessive current. The perfected model will admit of ready disconnection of the friction wheel from the tire, so as to render the magneto inoperative, and the transmission mechanism will have a dust shield.

Plants not Injurious in Bed rooms.

The well-known property of plants of giving off CO_2 has led to the presence of plants in sleeping apartments being popularly deemed undesirable. The experiments of a chemist in a London conservatory tend to prove such a supposition fallacious. In a conservatory containing 6,000 plants in the middle of the day oxygen had so far increased on the carbon dioxide that out of 10,000 parts only 1·40 proved to be CO_2, whereas the normal proportion of the purest air is about four parts in 10,000. After being shut up twelve hours the air in the greenhouse at noon thus proved to be surcharged with oxygen. The same air was analyzed just before sunrise, and the carbon dioxide had so far gained on the oxygen that the proportion of it was almost exactly four per 10,000. Taking the twenty-four hours round, therefore, the day just about balances the night.—Brit. and Col. Drug.

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GAS MOTOR CARS OF THE DESSAU TRAMWAY.

We give herewith a description of a system of tramway car propulsion by means of gas motors recently applied at Dessau, in Germany. The first section of the gas motor tramway of Dessau was inaugurated November 14, 1894, and the second on the 16th of December of the same year. The total length of these two sections is 2½ miles.

The track is of the normal gage of 4·75 feet between rails. The rails are the same as those used on electric tramways. The maximum gradients are two-thirds of an inch to the foot, and the sharpest curves are of 40 foot radius.

The rolling stock consists of nine automobile cars of the small type of the Lührig system. The weight of each car, ready for running, is six tons. The car has a capacity for twelve passengers standing upon the platforms and for fifteen seated, say, with the conductor, for twenty-eight persons.

The car has the aspect of an ordinary street horse car. The accompanying figure gives a view of one of the sides (that on which the motor is placed), with the doors that serve for the inspection of the motor removed. The cars, with the exception of the motors, were constructed at the Van der Zypen & Charlier works, of Cologne. The motors are from the Deutz works, of the same city. The motor, which is of the Otto type, is horizontal and has two cylinders in tandem, situated under one of the rows of seats of the car. It is of an effective 7 horse power, but is capable of developing ten per cent more. The transmission between the motor and the axles is so arranged as to communicate to the car a speed that may reach 7 or 9 miles an hour. The car easily ascends gradients in hauling another car full of passengers and not provided with a motor. Since the opening up of the line, the company has purchased freight cars and trailing cars.

GAS MOTOR CAR OF THE DESSAU TRAMWAY.

The car carries three gas reservoirs, two of which are placed under the platforms and one under the row of seats opposite that under which the motor is situated. Their total capacity is 28 cubic feet, which suffices for a round trip.

The peculiarity of construction of the first cars allowed them to be charged with compressed gas at the works of the builders. Upon reaching Dessau, after a travel of eight days upon the railway, they were placed upon the rails at the station, and were run to the tramway depot, at the other extremity of the city, through the utilization of the gas stored up at the works. This is a proof of the facility offered by illuminating gas for the transportation of power, and also of the perfect tightness of the reservoirs.

The charging of the gas reservoirs of the stations is effected through a threaded tubulure provided with a pressure gage placed upon the longitudinal wall opposite that of the motor. The taps for the injection and discharge of the water for cooling are situated above the mouth through which the gas enters. The charging is done in two minutes. The renewal of the water for cooling requires three or four minutes.

There are two compressing stations, each of which consists of a small 14·75 × 14·75 foot structure, provided on one side with a lean-to. In the interior of this structure there is a meter, an 8 horse power Otto gas motor, and a compressor. The illuminating gas is sucked from the pipe line of the city and forced into two reservoirs placed under the lean-to at a pressure of 20 atmospheres. From these reservoirs starts a small conduit that ends at a subterranean charging head placed in the vicinity of the tramway. In order to charge the car with gas, it suffices to screw the two threaded extremities of a flexible tube of the charging heads of the track and reservoirs and to open the cocks.

This installation might be still further reduced in area, and the reservoirs especially might be easily placed underground.

The capacity of the reservoirs of the charging station permits of filling two cars without actuating the motor. So the engines of the small works operate at Dessau only three hours a day. If they ran fourteen hours, they would suffice for the supply of forty cars. The two motors together of the compressing stations consume a tenth of the total quantity of the gas burned by the motors of the cars.

The population of Dessau is 42,500, and the establishment of the gas tramway has developed a taste for riding. So the success of the enterprise has exceeded all expectations. The existing lines have been lengthened by one and a quarter miles, and the number of cars raised from nine to thirteen. Of the four extra cars ordered, two are of 10 instead of 7 horse power. It is evident from these data that the tramway company is satisfied with its system of propulsion.

For the above details and the accompanying figure we are indebted to Le Genie Civil.

A Wire Flywheel.

Among the most recent and novel applications of wire, attention is drawn in Hardware to the wire flywheel lately erected at the Mannesmann Tube Company's works, Germany, and especially notable, in view of the well-known fact that heavy flywheels, driven at high velocities, present such dangers of breaking asunder from the great centrifugal force developed. The wheel at the factory mentioned is described as a cast iron hub or boss, to which are attached two steel plate disks, or cheeks, about 20 feet in diameter. The peripheral space between the disks is filled in with some 70 tons of No. 5 steel wire, completely wound around the hub, the tensile resistance thus obtained being found to be far superior to that of any casting. This huge flywheel is driven at a speed of about 240 revolutions per minute, or a peripheral velocity of 2·8 miles per minute, or approximately, 250 feet per second, which is said to be nearly three times the average speed of any express train in the world. For such a constructed flywheel the length of wire is estimated at about 250 miles. The tensile strength of paper being enormous, it is quite possible that some of the new big wheels will be built up with a paper rim.

Acetylene Explosion and Fire.

In New Haven, Conn., January 21, an explosion and fire occurred by which three men were killed and a building destroyed on account of experiments with acetylene, the exact nature of which and the especial cause of the accident cannot be accurately determined, as the apparatus was wrecked, several of the participants badly burned, and one killed. On the third floor of a four story brick building was the shop of Frank P. Phlegar, a machine jobber, who was said to be experimenting upon a regulator to control the delivery of gas from steel cylinders, about six inches in diameter by four feet long, in which liquefied acetylene was kept, the pressure of which, at 65° to 70° Fah., according to Lewes and Shuckert, would be about 600 pounds per square inch. It was known that when the explosion occurred seven men were standing about the apparatus, of whom one was killed and all the others badly burned and injured. A second explosion soon followed the first, the surrounding structures being badly shaken up, and flames enveloping the building, which was so quickly destroyed by the fire that two other occupants were burned to death.

John Fritz.

John Fritz, who was recently elected the President of the American Society of Mechanical Engineers, was born in Chester County, Pennsylvania, in 1822, and the first sixteen years of his life was spent on the farm of his father. He then went to Parksburg, near by, and secured employment in a machine shop. During his apprenticeship he had a most varied experience, which ranged from the cleaning of castings up to the management of the lathe. Young Fritz went to Morristown, Pennsylvania, where there were larger shops and greater opportunity for improvement. From there he went to Safe Harbor, Pennsylvania, where he put up the machinery of a rolling mill. He then began to acquire an experience in the rolling mill industry, both as an inventor and a builder of iron and steel making machinery, upon which his reputation chiefly rests.

He is considered to be one of the foremost of American metallurgists and is now superintendent of the Bethlehem Iron Works. In 1854 Mr. Fritz remodeled and rebuilt the Cambria Iron Works, at Johnstown, Pennsylvania, which was one of the pioneer iron and steel plants of the country. In 1857 Mr. Fritz constructed his first three-high roll train and produced iron rails with an economy hitherto unknown. In 1860 a company was organized to build furnaces and rolling mills on the banks of the Lehigh River, below Bethlehem, and Mr. Fritz was selected to plan and build the new works. His company was one of the first to begin the manufacture of Bessemer steel, and their success was largely owing to the ability and energy of Mr. Fritz, who has the distinction of being one of the few Americans who has been honored with the Bessemer gold medal from the British Iron and Steel Institute.

All honor is due to the man who has passed through all the rudiments of a trade and has risen to the highest point in the profession, and it is a handsome and proper recognition of his worth to be elected to the presidency of an important body like the American Society of Mechanical Engineers.

ONE hundred and sixty plows started in a row in a recent plowing match at Dartford, England.

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Glue Joints in Belts.

In regard to joining leather belts, a correspondent writes to the Woodworker and says: I have always had the best results by using common carpenter's glue, such as we use in the shop. I mended an old belt that drives a pony planer. The driver is 32 inch, the driven 10 inch, centers about 11 feet, and the belt has to be crossed. There are eight splices in this belt, all glued, and not a rivet in any one, as I consider rivets in a belt a perfect nuisance, and of no use whatever, except to weaken the belt where the rivets are put through. I also used a glued belt on the under head of a moulding machine and on the side spindles.

I have used glued belts on matcherhead spindles and always with the best results. The reason so many fail in their efforts to produce the best results is because they do not give enough attention to the details. My modus operandi is this: Scarf the ends with a plane and make a good length of splice. Have all nice and equal, so it will be same thickness as the rest of the belt when glued. Here is where the secret lies to make it hold: Before gluing, give all the ends a sizing of thin glue, in order to thoroughly fill up the pores in the leather. Let this get perfectly dry, then glue in the ordinary way, and let the glue get good and dry before using. I always give such a joint a good dose of neat's foot oil to limber it up. The belt referred to has been in use now two years, and only repaired once with a new lace. Experience has taught me it is money in pocket to make all repairs as thoroughly as possible.

Value of Wood Pulp.

It is stated that the paper required in the printing of the Petit Journal, of Paris, is equivalent to the consumption of 120,000 trees annually, converted into wood pulp. This requires an annual thinning of 25,000 acres of timber land. If a single newspaper induces such a slaughter of trees in one year, what must be the destruction of trees on paper account in all Europe? In Sweden, Austria and Germany, the regions of greatest supply of wood pulp, it is a question as to how to continue annual cuttings without exhausting the timber. In this country a like process is going on. There seems to be a possibility that pulp timber within a few years will become as important as that for lumber, particularly in localities where there is a large growth of spruce, aspen leaf poplar, or any other wood adapted to pulp making. Such timber will soon become in such request that extensive holdings of it will be sought as eagerly as the lumber woods hitherto have been, and a value will be placed on it undreamed of a few years ago. Then the newspapers will begin to prate of pulp barons and kings, as they now refer to pine barons and kings. Wild stories of pulp wood trusts and combines will be as rife as are such fairy tales about pine trusts and combines, which are evolved and sent broadcast to delude an easily prejudiced public.—Paper World.

Cleaning Castings with Sand Blasts.

The Iron and Coal Trades Review quotes a record made by Howard A. Pedrick of an experiment tried to determine the practicability of cleaning large castings by blowing sand against them under steam at a pressure of 60 pounds per square inch. It was found that the steam wet the sand, causing frequent clogging of the pipes, and made it next to impossible for a man to stand the severe rebounding of the sand from the casting. After a time, compressed air was substituted for steam, and the process was improved until at present ornamental and fancy castings can be thoroughly and cheaply treated in this way, producing an article which would otherwise require considerable labor to finish. In ordinary classes of work it is practicable to clean thoroughly six square feet per minute, no matter how much ornamentation covers the casting. Steel is very hard to clean in the usual manner, but yields readily to the sand blast. The outside appearance of the sand box is like that of a vertical boiler. It is fitted with feed valves and sand chambers, so arranged that an air pressure of about 10 pounds per square inch forces the sand through a rubber hose, which must be kept free from kinks, or the sand will destroy it.

Smithsonian Institution Jubilee.

In September of this year, the Smithsonian Institution, which has exerted an immense influence upon the development of science in America, and which has done more than any institution to make the results of scientific work known unto the ends of the world, will celebrate its jubilee. It is stated by Dr. Brown Goode, in a historical account of the Institution, that a special volume will be published to commemorate the event, and two memorial tablets will be erected in honor of the founder in the city of Genoa, where he died June 26, 1829: one in the English church, and one upon his tomb in the beautiful little English cemetery on the heights of San Benigno.—Nature.

SIR HENRY ACLAND has been presented with a testimonial by the University of Oxford, in recognition of his services to medical science and hygiene. The memorial takes the form of a bust and of a fund of $15,000.

Colors According to Latitudes.

An endeavor to find a cause for the predilection of certain peoples for a certain color, while such color is put under the ban in another latitude, must, we think, says La Science en Famille, prove futile. Why is yellow, as a general thing, displeasing to us, while in Guiana and the Antilles it is the color preferred par excellence? Why do we like blue, and why do the Japanese detest red? This is a matter of surroundings and habits and also of fashion for certain countries.

But if the cause is of slight consequence, the fact is, nevertheless, of interest to note, and we have evidently here ideas of extreme importance to the exporting manufacturer whose products are designed for remote peoples having customs different from ours. At the epoch at which Japan opened its ports to European commerce, a certain manufacturer of Havre hastened to ship thither fabrics of the most beautiful red. This detail, of trifling appearance, had escaped him. It proved a disaster and the goods remained on his hands.

Dr. Felix Regnault has endeavored to put a little order into the nomenclature of such preferences, and finds, along with all anthropologists who have studied the question, that savages are especially fond of luminous and dazzling colors. If we turn to the negro, the North American Indian, or the Polynesian, we find that he always has a predilection for red.

According to Cook, the New Caledonian admires everything that is red and is prodigal of this color for the embellishing of the poles of his huts, his carvings, and his images.

In New Zealand it would only be necessary to paint an object red in order to have it become a taboo.

The only colors known to the natives of Gaboon, before the arrival of the whites, were, according to Dolhac, red, white and black. To-day, they use blue as a color of mourning.

Capus remarks that the color preferred by the Siapoch Kafirs, a people of Afghanistan, is red, which is especially the color of certain ornaments of the chiefs.

Among the ancients the chosen color was purple.

On the contrary, the peoples of the north have a particular liking for somber colors.

We are especially partial to blue, and regard yellow as ridiculous.

In Japan, light Prussian blue and greenish blues prevail in clothing.

The savage Ainos of the island of Jesso, according to Dybowski, prefer blue, and tattoo themselves with this color alone.

Let us now pass to the French colonies. In Congo, De Brazza always carried bright red cotton cloth for his exchanges. On the contrary, in the Soudan, we have to do with the Mussulmans, who are more civilized. The medium of exchange is here blue or long cotton cloth. The latter is dyed indigo blue in the Indies, and any other shade of blue would be rejected.

The Mussulman negro is distinguished from the fetichist negro by his love for blue, while the fetichist prefers red. The former tattoos himself with blue, while the latter smears his body with ocher.

In the French Indies, the clothing worn is especially red and yellow, while blue finds little favor. One of the main affectations of the women is to color their skin with saffron.

In Cochin-China the colors most used are yellow and red, and then comes green. The gods are gilded.

The negroes and the natives of Guiana and the Antilles have an especial fondness for fabrics of a yellow ground. Fashion does not lose its rights and the ground always persists, but the designs upon it may be modified.

In Tahiti the aborigines adopt a pale rose color for their clothing.

The Germans make a singular deduction from the passion of savages for gaudy colors, and have concluded therefrom that they do not perceive violet, blue, or green. These colors, in fact, have no name in the language of some of these peoples. Without going farther, moreover, the ancients had no special names to designate all colors. The Israelites knew only white, black, green and red, and in Homer, according to Gladstone, we find special names only for green, blue, and violet. But why not simply admit that savages, having a language poor in precise terms, denominate only that which strikes them, and that somber colors being indifferent to them, they do not think to mention them by a specific name.

Thus, the Battas of Sumatra, in contact with the Dutch, have taken the term blue from the language of the latter to designate that color, which they distinguish perfectly. So, too, certain African peoples have borrowed the word blue from the English. They, therefore, distinguished the color previously, but did not concern themselves about giving it a name. The Cree Indians of British America call blue by a name signifying "dead man's country color," i. e., "sky color," the spirits of the dead being supposed to ascend to the sky.

The ancients had no special terms to designate certain colors, and yet they used them in profusion upon their monuments.

The Egyptians used yellow, red, blue, green, brown, white, and black, and had a correct perception of the harmony of colors.

The two colors that occupy most space in the decorations of the enameled bricks of the Assyrians are blue and yellow. Blue almost always furnishes the ground, while the majority of the figures thereupon are yellow.

The Persians made much use of these two colors, but they likewise employed green and red. Moreover, they set off their palaces with plates of gold, silver, bronze, ivory, and choice woods.

Finally, the Greeks were fond of color. We know that they had the habit of painting the frieze of their structures blue. In the Parthenon, the front of the metopes was red, and blue and yellow were distributed throughout the rest of the edifice.

In our epoch, it seems that we are timidly returning to ancient practices. At the Universal Exposition of 1889, polychromy was tried, but blue always predominated.

Efficiency of Building Materials Against Fire.

Experiments have lately been made in Vienna for the purpose of testing the efficiency of various building materials against fire, and also to ascertain what protection they were capable of affording to iron work. To make these tests a brick chamber some 12 ft. by 8 ft. in plan and 11½ ft. high was built, and in the center an iron column was constructed consisting of two channel bars, 5½ in. by 2¾ in. These channels were placed 2½ in. apart, back to back, and were braced together with light lattice bars. Within the space between the channels test bars composed of various alloys melting at temperatures between 150° F. and 1650° F. were placed, the column afterward being surrounded with brick work in mortar, thus forming a pier some 18 in. square. In order that the test should as nearly as possible resemble the conditions met with in actual practice, the column was loaded with a sufficient weight to cause a stress of 3½ tons per square in. on the iron work. Fuel was then strewn over the floor of the chamber to a depth of some 3 ft. and the firing was fully maintained for a space of 2½ hours, and was subsequently extinguished by the fire brigade. The heat had, however, been so great that it was not until the next day that a thorough examination of its effects could be made, but it was then discovered that, although the edges of the brick work pier were crumbled to an extent of 1½ in., the iron column was quite uninjured, and only the test bar, capable of fusing at 150° F., showed any indication of melting. It would thus appear that the brick work was of ample thickness to protect the iron work, and that when such construction is adopted in actual practice a building is probably as fireproof as it is possible to make it.—Construction News.

Palace Cars on Trolley Lines.

The recent growth and development of Brooklyn is largely due to the extension of the surface railway companies' system, whose lines now extend for miles into the country. Last summer the Brooklyn Heights Railroad Company placed several excursion cars in service. These cars were profusely decorated and were furnished with incandescent lamps of all colors. They could be chartered for trips of all kinds, and it was not an unusual sight to see a procession of five of these cars, the first having a band, passing through some of the principal streets. The same company has just built and equipped two handsome parlor cars for winter use. The cars are intended for theater or skating parties and for the use of any persons who may be inclined to visit outlying sections of Brooklyn, either for business or pleasure.

The cars are 25 feet long inside and have platforms 5 feet in width, upon which can be placed four seats, for purposes of observation or for those who care to smoke. The cars are equipped with standard air brakes and ride on easy half elliptic and spiral springs. The exterior of each car is painted a royal blue, with gold letters; the platforms are inclosed with brass open grill work, railings and ornamentation. The interiors of the cars are finished in mahogany and are decorated in old gold and light umber. In each corner is a small buffet with a plate glass mirror door and a small cabinet or sideboard where lunch may be served. The floors are carpeted and have luxurious cane chairs upholstered in plush, every effort being made to provide the greatest possible comfort. The plate glass windows are hung with old gold and blue curtains. The cars are lighted and heated by electricity and the electric call bells provide a ready communication with the waiters, who are in attendance whenever luncheons or suppers are given on the car. The cars can be chartered for the evening or for any period.

IT is said that the exports from Great Britain into the United States only amount to some $90,000,000 annually, while the imports into Great Britain from the United States amount to some $445,000,000 per annum, the balance of trade being about $355,000,000 in our favor.

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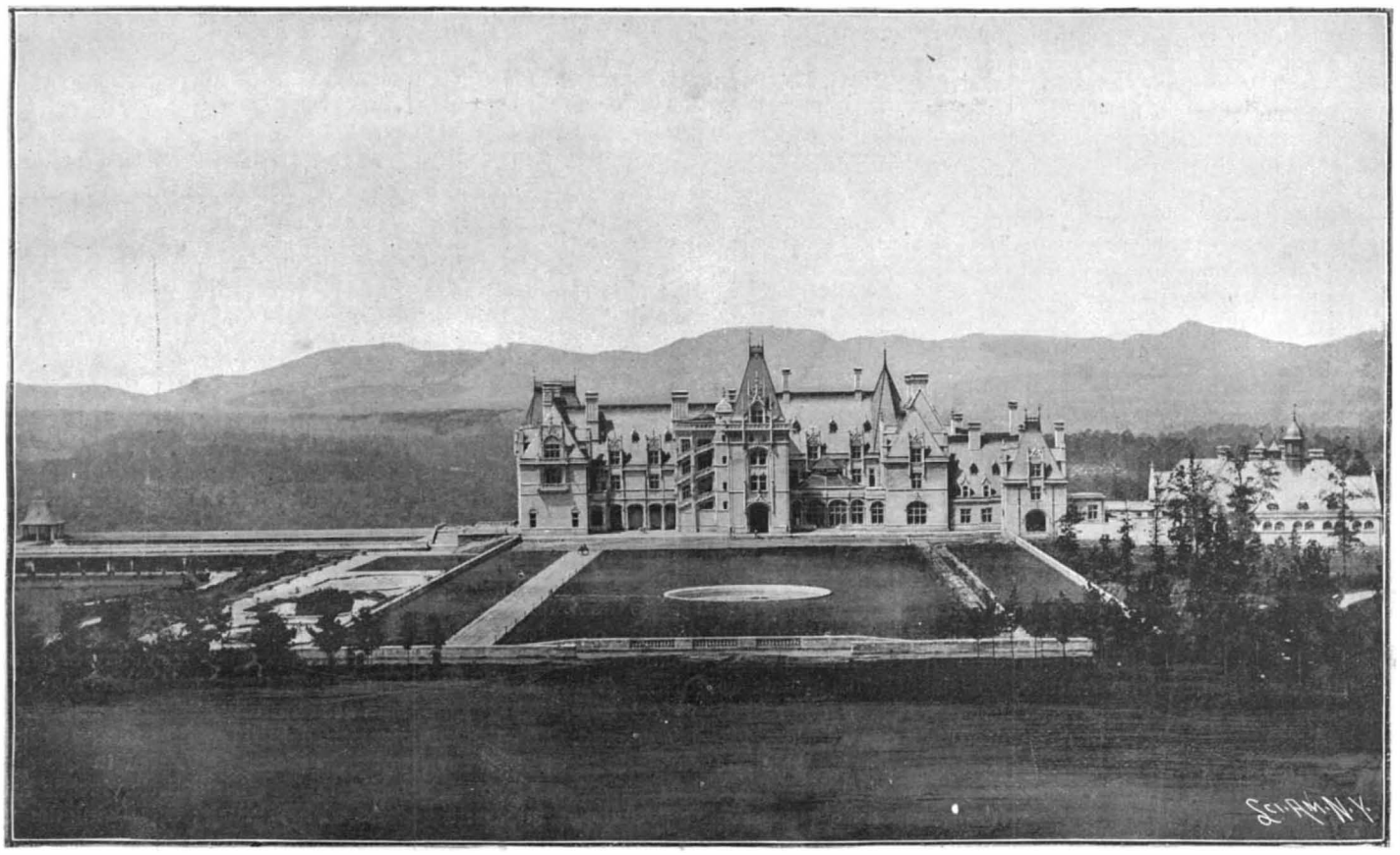
MR. VANDERBILT'S ESTATE, BILTMORE.

Mr. Vanderbilt's estate, Biltmore, is about six miles from Asheville, North Carolina. Access to the grounds may be had by procuring a pass from the resident manager. The tract of land upon which this modern castle is built consists of nearly one hundred thousand acres (more than one hundred and eighty square miles), one portion of which touches the limits of the city of Asheville, from which point it stretches over mountain and valley so far that it is possible for the owner to ride thirty-five miles straight as the bee flies from his chateau without leaving his own property.



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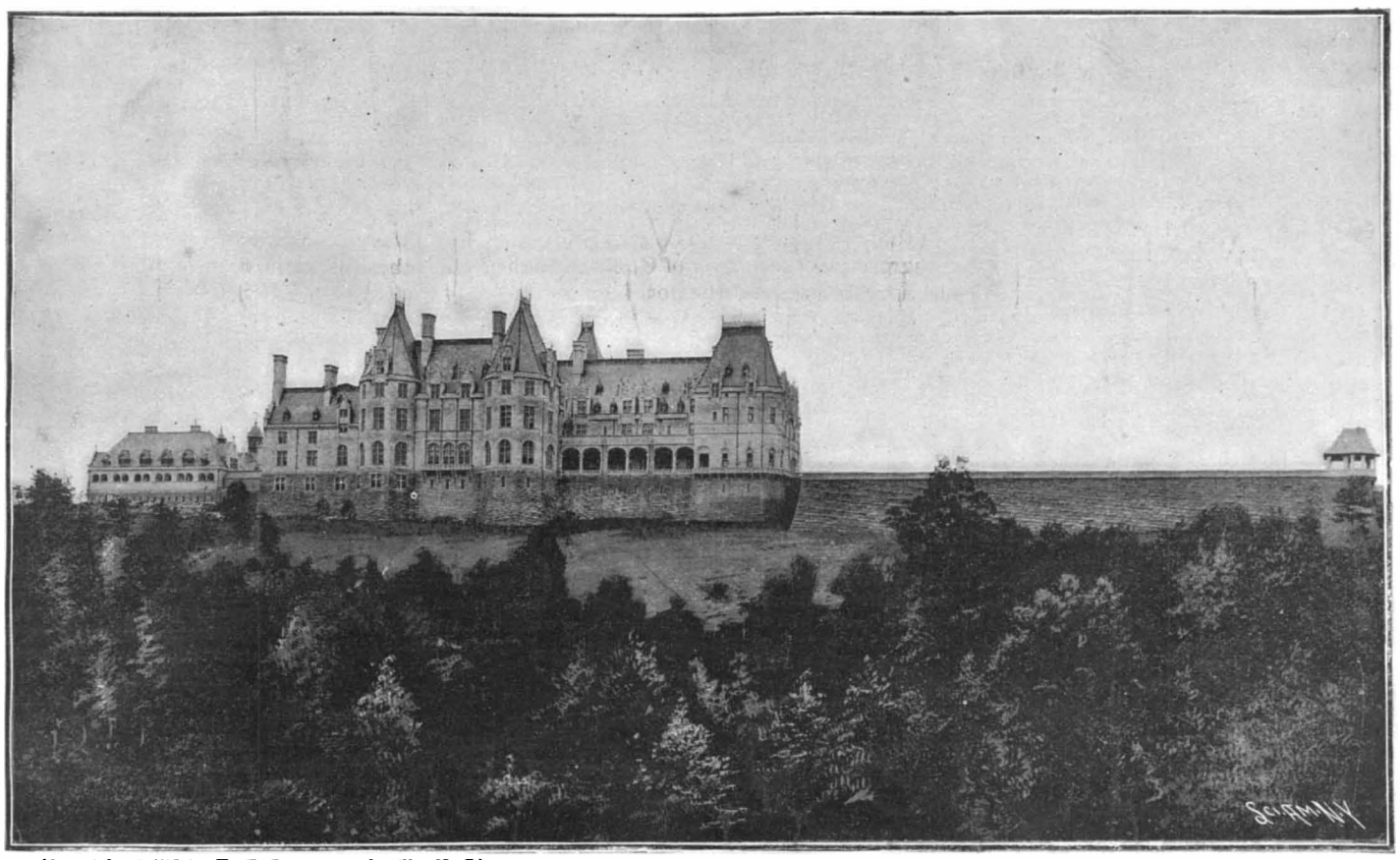
BILTMORE MR. GEORGE VANDERBILT'S ESTATE AT ASHEVILLE, N. C.

The only private estate larger than this in America is that of Dr. Seward Webb, at Neha-sa-ne, in the Adirondacks, which covers two hundred and fifty thousand acres of virgin forest, streams and lakes; which is surrounded by ninety miles of nine foot wire fence and which contains within its limit over fifty highland and lowland ponds and lakes. Dr. Webb preserves an immense number of trout, salmon, deer, bear, foxes and smaller feathered game within his cordon of wire. Mr. Vanderbilt began four years ago to construct his immense château, and, although several hundred skilled workmen have been employed thereon constantly, it is not yet quite completed. There is nothing of particular interest on the road to Biltmore, which winds through romantic defiles, crosses streams, and plunges through fragrant groves of transplanted firs. After crossing the Swannanoa one sees row upon row of trees in regular marshaled lines. These are Mr. Vanderbilt's private nurseries. They consist of from sixty to seventy acres of land and have been laid out and developed under the artistic eye of Frederick Law Olmsted, the world renowned landscape gardener.

It is intended solely as a source of supply for the requirements of Biltmore. One million plants for the sides of the many woodland roads are turned out of these nurseries annually, and two million plants are now growing which will be used to replenish the denuded hill sides. The total number of plants raised in these nurseries up to date is not much short of five million. The propagating houses show great beds planted thick apparently with toothpicks—small slips of endless varieties of trees and plants.

Mr. Vanderbilt has photographs at Biltmore of all the celebrated arboretums in the world. His plant and tree nursery will exceed all the others in size and extent. When completed they will constitute an immense museum of living trees and shrubs laid out in the form of a winding road twelve miles in length, traversing all kinds of soil. This variety of soil is necessary, for the plants are from all parts of the world. The different soils are analyzed at frequent intervals, so as to find adequate reasons for failures or successes in trees and plant raising. The road in the near vicinity of the house not only leads through the wildest and most picturesque mountain scenery, but each side of it is as highly cultivated as a rose garden. And yet the random profusion and extravagance of nature is so perfectly imitated that one would not suspect the interfering hand of man. Small evergreens and trailing vines render the ground a carpet of unbroken verdure. Ram Branch (of happy moonshiner melody) is frequently crossed on viaducts ranging in cost from $8,000 to $10,000 each. From the woods, the traveler emerges upon immense clover meadows and rolling paddocks. The roads through these flock-strayed valley lands lead in all directions from the "Castle," and amount in all to some sixty miles in length. The "Castle" is reached after three miles of this delightful wayfaring. It looks very much like a dream fabric standing out as it does from the hazy blues and greens of sky and mountain.

The mansion itself fronts east and is situated upon a level esplanade 700 by 800 feet. This level space has been artificially made by cutting off the summit of a mountain and filling up the surrounding depressions. Its retaining wall of stone, 16 feet in thickness at the base and rising in places to the height of 40 feet, is the most remarkable feature of the esplanade. The retaining wall around this bowling green is surmounted at the south end of the house by a breast-high coping of dressed stone. This bowling green was originally intended for the tennis court. Outside of the esplanade and at the foot of its encircling wall are the great sheds for the stone cutters and builders, and the tracks of the railroad which Mr. Vanderbilt constructed from Asheville. The outside walls of the house measure 375 by 192 feet. From the windows there are views of surpassing loveliness. The French Broad flows below and winds away in both directions. On either side the river lie luxurious green valleys, and in them the stream narrows into pebbly rapids or widens into placid lily padded lagoons. Beyond the valley rises the sharp, symmetrical cone of Pisgah; and the line of summits rising constantly from it ends in the six thousand feet of Balsam Mountains. Far away are the misty peaks of the Great Smoky Range. To the northeast extends the valley of the Swannanoa all the way to the famous Black Mountain Chain. To the right the valley is flanked with the high and graceful Swannanoa Mountains. In the far distance lies the Swannanoa gap, through which the railroad enters the mountain defiles. Toward the south, where all is gentle, peaceful and in charming color, the mountains withdraw to a distance, leaving an open country dotted with farms, until far away the hazy curtain made by the indistinct forms of the Blue Ridge is drawn around the scene along the South Carolina border. This is the very heart of the fabled abode of the primitive North Carolina "cracker" and "moonshiner," the home land of Mrs. Burton Harrison's heroine. It is unnecessary to state that game preserves will be plenty, and that in time hundreds of deer will roam at will through forest and meadow.



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VIEW OF BILTMORE FROM BELOW THE TERRACE.

This palatial residence was built under the direction of the late R. M. Hunt, of New York City. The style is French Renaissance and the material used is Bedford stone; the motive of the building seems to have been taken from the château at Blois.

The exterior of the château is very picturesque, as the sky line is broken by towers, mullioned windows, statues and gargoyles. On a nearer approach, the eye is attracted by the large amount of fine stone carving.

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Probably the most pleasing feature of the eastern façade is the winding stair tower, which is at the left of the main entrance. This tower is very suggestive of that in the museum at Nuremberg. The building is really divided into six sections; in one is the library, in the second the private study of Mr. Vanderbilt and the picture gallery, in the third is the music room, salon, breakfast room, kitchens, etc. In the fourth section is the main entrance, the great living hall, and, of course, other rooms in the upper stories. Under the main entrance is a large swimming pool and lounging room. The other sections contain a winter garden and great banquet hall, the bachelors' quarters, billiard and smoking rooms, gun rooms, offices, etc. The banquet hall is the most imposing room in the entire building. It is 72 by 42 feet, and the ceiling is 65 feet high. It has a most elaborate marble mantelpiece. The ceiling of the library is decorated by a painting by an old master. The mantel is made of green marble from Japan, and the fireplace is so constructed that the stairway leading from the guests' chambers above is built down the middle of the chimney to the mantelpiece. The breakfast room is wainscoted with Numidian marble. The winter garden is a charming place. The marble floor is sunk three feet lower than the rest of the first story, so that one might look into this garden from nearly all of the principal rooms on the ground floor, the sides being of plate glass. In the center of the garden is a beautiful fountain. Even the roof is of French plate glass, nearly an inch thick. Mr. Vanderbilt's private apartment is finished in Louis XIV style. The mantel in the smoking room is a very old mantel, and indeed the whole house is being filled with fine objects of art collected by its cultured owner. A colonnade leads to the sunken garden, which is a very beautiful feature of the grounds. The columns are already covered with ivy, the gardener having planted it at both the top and bottom of the columns. There is a large stone terrace in front of the house, and in the esplanade is a fountain with a basin 30 feet in diameter.

Dotting the margin of the ascent to the house are nine drinking fountains. The idea of this picturesque ascent was suggested by an old castello in Italy. It is hard to tell where house ends and stable begins, for the latter is joined right on to the house and is beautifully built. The interior of this stable is finished with white enameled brick, such as most people are glad to have round their fireplaces. During his periodical trips to Asheville, Mr. Vanderbilt lives entirely in his private car, which is replete with all the luxuries of home.

The Color of Atoms, Ions, and Molecules.

This obscure but fascinating subject has recently been studied by M. Carey Lea, who contributes to the American Journal of Science perhaps the most interesting paper which has yet appeared on it. The method of investigation pursued bears a resemblance to that adopted by Mendeléef when compiling his celebrated table, and which has been so lucidly described by Lothar Meyer in his Modernen Theorien. It seems that when the elements are divided into two series, one containing those whose atoms show color in combination, the other those whose atoms in certain cases, or in all cases, show no color, it is seen that this classification corresponds very closely to the chemical properties of the elements. Ewan has shown that the color of a copper sulphate solution is not due to the free ions or to the molecules, but must be due to the atoms, whether they be present as ions or combined with another ion to form an electrolyte.

Lea states that in an electrol te which gives a colorless solution in water, both cathion and anion are colorless. There is no connection between the color of an atom and the color of the element formed by a combination of atoms. In an electrolyte which gives a colored solution in water when the anion is a single atom, the color is due to the cathion, for all elementary anions are colorless. Even if an anion is a complex one and is colorless, the color of a solution of an electrolyte containing this anion is to be referred to the cathion. The color, or lack of color, of the atom of an element is a function of its atomic weight.

Elements with atomic weights, 1—47 have only colorless ions, 52—59 colored, 65—90 colorless, 103—106 colored, 112—139 colorless, 145—169 colored, 192—196 colorless. Elements which have atomic weights between these groups have both colorless and colored ions. Lea has arranged the elements in a periodic system, on the basis that no element which in all its combinations shows colored ions can be combined in the same natural group with elements which have colorless ions. Those which have colorless ions can be arranged in nine horizontal groups, in which each element falls naturally into its proper place. The division of the elements contains all those whose ions can act as anions.

Elements which have only colored ions can be arranged similarly in five vertical series; this division contains elements whose ions can only act as cathions. Eleven other elements remain whose ions are either colored or colorless. In the whole series of all the elements, these elements come between a group of elements which have colorless ions and one of elements which have colored ions. There is no case in which an element with only colorless atoms falls in the periodic series between one of these eleven elements and an element with only colored atoms; and also an element with only colored atoms never comes between one of these eleven elements and one with only colorless atoms. The conclusion is that the color of the elementary atoms is a function of their atomic weights.

Cement for Leather Belting.

The importance of suitable cement for making joints in leather driving belts has led the Society of Chemical Industry to indorse the following formula: First, equal parts of good hide glue and American isinglass, softened in water for 10 hours, then boiled with pure tannin until the whole mass is sticky, the surface of the joints to be roughened and the cement applied hot; second, one kilogramme of finely shredded gutta percha digested over water bath with 10 kilogrammes of benzol until quite dissolved, when 2 kilogrammes of linseed oil varnish are stirred in; third, 1½ kilogrammes of finely shredded India rubber are completely dissolved in 10 kilogrammes of carbon bisulphide by heating, and while hot 1 kilogramme of shellac and 1 of turpentine are added, and the solution heated until the two latter ingredients are also dissolved; fourth, 1 kilogramme of best glue is dissolved at a moderate heat in 1½ kilogrammes of water, and thickened to the consistency of sirup. One hundred grammes of thick turpentine and 5 grains of carbolic acid are carefully stirred in while hot; the mixture to be poured into flat tin pans and allowed to cool, then cut into pieces and dried in the air. The cement is made liquid with a little vinegar and applied to the joint with a brush; this being done, the two ends of the joint are properly placed together and thoroughly pressed between two iron plates heated to a temperature of about 86° Fah.—Railway Review.

THE longest telegraph line in the world above ground and without a break has just been completed in Australia. It runs from Rockhampton, in Queensland, to Broome, in Western Australia—a total length of over 6,000 miles.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR FENDER.—James B. Morrow and Franklin C. Robertson, Oxford, Md. This is a simple and inexpensive device, readily attachable to and detachable from the front of a car, and which can be raised or lowered at pleasure from the platform to catch and support any one caught in the course of a moving car. The fender is hinged at its center to the car, and has hinged arms fitted to slide on the under side of the platform at each side, a bar being connected to the arms and a cranked operating shaft. The fixed section of the fender carries a sliding spring-pressed section, and the fender turns curves without projecting too far to one side.

SIDE BAR FOR OPEN CARS.—John R. Gathright, Louisville, Ky. To prevent passengers getting off a car in front of a moving car on another track, this inventor provides a side bar that may be removed by reversing the seat backs at the ends of the line. A series of bars across the side openings is pivoted at one end of each bar to a fixture of the car, each bar being connected with the seat back forward of that bar, so that the reversing of the seat back will raise the connected bar and open the passage to that seat.

Electrical.

RELEASING DEVICE.—Stewart H. Reynolds, San Jose, Cal. This is a device for use in stables, engine houses, etc., to release horses in case of fire. It consists of a perforated casing having a chamber to receive the end of the halter, a spring-actuated bolt sliding in the casing, in which also is pivoted a latch to engage and move the bolt, the other end of the latch being engaged by a notch in a spring-actuated armature lever connected with an electro-magnet.

Mechanical.

ROLLER FEED MILL HOPPER.—Arthur Wyker, Philadelphia, Pa. To regulate, in a simple and inexpensive manner, the supply of material to the rollers in the mill this inventor provides a regulating roller conveniently adjustable to and from the feed cylinder. A directing board forms a section of the hopper bottom and leads to the rollers, there being a feed cylinder within the hopper above the board, and the regulating roller being located above the feed cylinder. The feed cylinder and regulating roller retard the material as desired in its passage from the hopper proper to the rollers.

SELF OILING BOX.—David L. Altman, Eau Claire, Wis. To distribute a lubricant properly and evenly on a revolving shaft, without the possibility of the entry of dust, the journal bearing is made with a central and inclosed oil well communicating with the journal, and there being at each side of the well a dust chamber, the dust chambers having their walls in closed contact with the journal. It is immaterial in which direction the shaft is run, and the lubricant may be used continuously from two to four weeks without cleaning the well or refilling it.

COTTON CLEANER AND FEEDER.—Martin L. Moore, Forney, Texas. This is a machine having a vacuum box with a screen and a separating drum at one side of the screen, a vacuum and a suction pipe entering the vacuum box at opposite sides, one supplying the cotton and the other removing the dust, while an endless carrier beneath receives the cotton, there being a feed belt at the end of the carrrier moved by contact of the moving cotton. The machine is designed to clean, shred, or separate cotton and deliver it to one or more gins.

Agricultural.

PLOW.—William H. Bradshaw, Orange, N. J. This is a machine in which the plow blades are attached to an endless carrier operated by a sprocket wheel across the rear of the machine, motion being communicated from the axle through a worm wheel shaft to the sprocket wheel as the plow is drawn along, and means being provided for conveniently raising or lowering the plows, and holding them in any desired position.

HEDGE TRIMMING.—Edward C. and Alphus M. Gordon, Chetopa, Kansas. This is an improvement on a formerly pateuted invention of the same inventors, providing a cutting apparatus for a horse power hedge trimmer that will need no costly driving gear, but can be secured to the shoe of a grass mower, and operated by the driving gear as if it had been made for that sole purpose. The cutter is readily adjustable to cut either side of the hedge from top to bottom, or to cut across it from side to side, making a hedge fence of any desired height or width.

Miscellaneous.

ADDING MACHINE.—Albert L. Crowson, Sparta, La. This machine has number wheels with laterally projected pins, combined with a tilting key having integral upturned and curved inner end movable in the arc of a circle, and links connect the lever with curved racks, a stop limiting the downward movement of the rack with relation to the key. The machine is of great durability and simplicity, can be rapidly operated, adding whole numbers and fractions with absolute accuracy. The arrangement of number wheels and carrying devices is novel, and may be used with any suitable key mechanism.

DENTAL HAND PIECE ATTACHMENT.—Christian M. Meister, Allentown, Pa. This is a holder adapted as a chuck or head for small drills or other boring tools, in which a drill may be conveniently placed, firmly held, and readily removed. The device may be used as a brace or in connection with a dental engine, the holder being made in adjustable sections, whereby the drill may be placed and locked at any angle to the shank or stem communicating the power.

WAGON BRAKE.—Laurens S. Wheeler, Tyro, Kansas. Levers and rods at each side of the vehicle, according to this improvement, are connected with brake shoes in position to bear on the wheels and adapted to be operated by a brake lever, a wedging action being exerted on the shoes to force them against the wheels with considerable force when the brake lever is only slightly moved. The improvement is especially designed for use on heavy vehicles, when it is necessary to secure the greatest possible pressure on the wheels.

FORE CARRIAGE.—James Duncan, Adelaide, South Australia. According to this improvement, circular wheel plates or fifth wheels are dispensed with, and in their place are used bosses or bosses and collars with stays, which connect with the carriage body and the turning part of the fore carriage to evenly distribute the strains. The stays connecting the fixed collar and boss to the carriage body, and those connecting the turning collar and boss to the turning part of the fore carriage, may be made of any curve or shape adapted to the style and details of each vehicle

HEEL SPRING.—Frank McDonald, Malden, Mass. To cushion the step of one in walking this inventor has devised a specially constructed spring plate held to the shank of a shoe and projecting over the heel, where an auxiliary spring is employed on its under surface, next to the top lift of the heel. The improvement is especially adapted for use by railroad men, who are subjected to the incessant jar and vibration of a moving train.

CURTAIN FIXTURE.—Fred. L. Watts, Springfield, Mo. A ratchet mechanism, according to this improvement, is so connected with the spring roller that the spring can be tightened or loosened without handling the curtain, and the spring gear can be quickly thrown out of gear to permit of an easy movement of the curtain when used in connection with the usual pulley clamp and cord devices to pull the curtain up or down.

COAL DELIVERY IN DWELLINGS.—Charles S. C. Rock, New York City. To enable a tenant to automatically fill a bucket with coal from a coal bin in the cellar, and hoist the bucket to the floor on which the coal is to be used, this improvement comprises a double acting gate in the chute of the coal bin, the gate being actuated by a lever connection, as the bucket or other receptacle is lowered sufficiently to receive a duly measured quantity of coal.

LATCH.—Charles E. Whipple, North Charlestown, N. H. This improvement relates to gate fasteners of the gravity latch type, a winged latch block being pivoted in a casing from which extends a bracket arm adjacent to the block, a locking dog being pivoted near one end of the arm with its other end engaging between the wings of the latch block, while a transverse lever is mounted to rock and lift the end of the locking dog. The device is strong, durable, and inexpensive.

LOCK.—William E. Winters, White Lake, N. Y. This is a lock requiring no key, the door being locked on the inside by turning the knob, and the lock being arranged not to unlock from the outside. The improvement comprises a bolt adapted to receive a sliding motion from one knob spindle and a swinging motion from the other knob spindle, a keeper with a partition forming a rest for the bolt.

QUILTING FRAME AND TABLE.—Robert L. Burns, Trenton, Texas. A base and standards are, according to this improvement, adjustably and pivotally connected, and quilting frame end blocks are adjustably connected with the standards, removable side bars connecting the end blocks, and a lower removable tie bar connecting the centers of the end blocks, while a tension device connects the standards. The frame may be adjusted for use as an ironing or cutting table, and may be folded to occupy but small space.

PHOTOGRAPHIC DISPLAY CABINET.—Henry W. Potteiger and William A. Kohman, Reading, Pa. This is an improvement on a formerly patented invention of the same inventors, the cabinet having a series of pivoted leaves with vertical movement, each leaf having a rearwardly extending arm engaged by a spring locking bar connected with a push rod. The cabinet has but few pieces, which may be made so strong as to prevent disarrangement by ordinary usage.

UMBRELLA RACK.—Alexander H. Davison, Athens, Ga. This rack has vertical standards on which are movable collars carrying bearings, in each pair of which revolves a shaft or axle, there being pairs of pulleys on each shaft, each carrying an endless slatted belt with clasps. The rack forms a vertical frame with an endless belt on which a large number of umbrellas may be carried in convenient position for their display.

COUNTER STOOL.—This is a further invention of the same inventor, providing a movable stool readily adjustable along the front of a counter, enabling a seated customer to conveniently move along without rising. In the front of the counter are upper and lower tracks in which move wheels on the ends of a telescopic body section, and from this section extends a bracket which supports a seat.

ROTARY CABINET.—James E. Stephens, Ochlochnee, Ga. This cabinet is adapted to hold fibrous fabric in rolls and permit the removal of a desired quantity of the goods from any roll. It is especially adapted for lace and embroidery, there being in the walls of the cabinet delivery apertures corresponding to the separate pivoted rolls, through which the goods may be withdrawn, the portions on the rolls being protected from light, dust and detrimental handling.

SPORTSMAN'S CABINET.—George Porteus, Guelph, Canada. This is a cabinet having spaces to receive fishing rods, guns, revolvers, hunting knives, etc., and receptacles for ammunition shells and devices used in connection therewith. The cabinet is also provided with a folding table which may be readily brought into position for working purposes, and which may be folded out of the way without being disconnected from the cabinet.

Designs.

GLOVE.—Peter Chatelain, Boston, Mass. Two design patents have been granted this inventor for gloves having a slit at the side from the back edge along the wrist portion, while a flap or flaps extend along the wrist portion at the opening, the flaps terminating short of the hand portion.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

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Whereas, the copartnership heretofore existing in the City and State of New York between Orson D. Munn and Alfred E. Beach, under the copartnership name of Munn & Co., and having its principal place of business at No. 361 Broadway, in the City and State of New York, has been dissolved by the death of Alfred E. Beach on January 1, 1896; and

Whereas, the said copartnership had business relations with foreign countries and transacted business in the State of New York for a period of five years and upward; and

Whereas, I, Orson D. Munn, the surviving copartner, am desirous to continue the business conducted by the said copartnership and to continue the use of the name of Munn & Co.

Now, I, Orson D. Munn, do hereby certify and declare that I am the person dealing under such name of Munn & Co., and that my place of abode is 14 East Twenty-second Street, City of New York, and that my principal place of business is at No. 361 Broadway, in the City and State of New York.

(Signed) ORSON D. MUNN. [L.S.]

In presence of
A. A. HOPKINS.

City and County of New York, ss:

On this 6th day of January, in the year 1896, before me personally came Orson D. Munn, to me known to be the individual described in and who executed the foregoing instrument and acknowledged to me that he executed the same for the purposes therein mentioned.

(Signed) A. A. HOPKINS,
[L.S.] Notary Public,
Kings County, New York.

Certificate filed in New York County.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Minerals sent for examination should be distinctly marked or labeled.

(6704) T. O'C. asks for a formula for a benzine and petroleum resisting cement, and also for bicycle cements. A. Cement to resist benzine and petroleum: It has quite recently been discovered that gelatine mixed with glycerine yields a compound liquid when hot, but which solidifies on cooling, and forms a tough, elastic substance, having much the appearance and characteristics of India rubber. The two substances united form a mixture entirely and absolutely insoluble in petroleum or benzine, and the great problem of making casks impervious to these fluids is at once solved by brushing or painting them on the inside with the compound. This is also used for printers' rollers and for buffers of stamps, as benzine or petroleum will clean them when dirty in the most perfect manner in an incredibly short space of time. Water must not be used with this compound. Cement for Cuts in Bicycle Tires, etc.—In 10 oz. carbon bisulphide dissolve 20 oz. caoutchouc; 10 oz. gutta percha; and 5 oz. fish glue. Bind the tire well with cord until set. Bicycle Tire Cement.—2 parts of pitch and 1 part of gutta percha are melted together. Use hot.

(6705) P. W. N. asks for information on the sand blast process of engraving. A. Sand driven by an air blast of the pressure of 4 in. of water will completely grind or depolish the surface of glass in ten seconds. If the glass is covered by a stencil of paper or lace, or by a design drawn in any tough elastic substance, such as half dried oil, paint or gum, a picture will be engraved on the surface. Photographic copies in bichromated gelatine from delicate line engravings have been thus faithfully reproduced on glass. In photographic pictures in gelatine, taken from nature, the lights and shadows produce films of gelatine of different degrees of thickness. A carefully regulated sand blast will act upon the glass beneath these films more or less powerfully, in proportion to the thickness of the films, and the gradations of light and shade are thus produced on the glass. In the apparatus used air rises through a curved tube, carrying the sand up with it, which is thrown into the air tube by an endless belt of scoops arranged in the lower part of the angular box. The sand is carried up by the air and brought over and down the front air tube, where it discharges with great force upon the surface of the glass, which is contained within the front box and is carried by a belt gradually forward under the blast.

(6706) J. W. B. asks how to prevent a crack in a piece of metal from extending. A. A crack in a piece of metal is prevented from extending further by the well known means of drilling a hole where the rent ends; but when the hole is not bored on just that spot, the crack is apt to continue beyond the hole. To facilitate the search for the exact point, Revue Industrielle recommends moistening the cracked surface with petroleum, then wiping it and immediately rubbing it with chalk. The oil that has penetrated into the crack exudes, and thus indicates with precision where the crack stops.

(6707) A. C. writes: I wish to obtain full information about electric furnaces, acetylene gas, carbide of calcium, the reactions and the pressure required to reduce the gas to liquid form. A. We refer you to the following SUPPLEMENTS, which give very exhaustive information and the most recent reliable data concerning acetylene and calcium carbide: SUPPLEMENTS, Nos. 998, 1004, 1007, 1012, 1013, 1014, 1015, 1016, 1035, 1038. We also have several articles on the subject in the SCIENTIFIC AMERICAN. Electric furnaces are treated of in several SUPPLEMENTS. We can supply all of the above. You can get calcium carbide of Elmer & Amend, 211 Third Avenue, New York City.

(6708) C. S., Utah, asks: Which is the best method to temper and magnetize steel rods 4 inches to 6 inches long and from ⅛ to ¼ inch in diameter? A. Any steel bars, rods, or drawn steel wire that will harden may be used for magnets. The pieces, if required to be straight after hardening, should be straightened and annealed, and then made straight in their soft state. Then heat to a full red by daylight and plunge in water vertically by dropping. Then clean so that the tempering color can be easily seen, draw the temper on an iron plate to a deep orange color and cool in water. To magnetize lay the ends of the erods alternately on the n. and s. poles of a permanent or electro-magnet, or, if convenient, you can utilize the magnet of a dynamo or motor.

(6709) H. W. P. wants to know how to make gelatine sheets. A. Dissolve fine glue or isinglass in water, so that the solution when cold may be consistent. Pour it hot on a plate of glass (previously warmed with steam and slightly greased) fitted in a metallic frame whose edges are just as high as the wafer should be thick. Lay on the surface a second glass plate, also hot and greased, so as to touch every point of the gelatine while resting on the edges of the frame. By its pressure the thin cake is rendered uniform. When the glass plates have cooled the gelatine will be solid and may be removed. It can then be cut into disks by punches, etc. It can, of course, be colored by adding suitable coloring material, aniline colors for instance.

(6710) H. R. T. asks for directions for preserving the natural colors of flowers. A. A recent improved receipt for preserving plants with their natural colors is to dissolve 1 pt. salicylic acid in 600 parts alcohol, heat the solution up to boiling point in an evaporating vessel and draw the plants slowly through it. Shake them to get rid of any superfluous moisture and then dry between sheets of blotting paper under pressure in the ordinary manner. Too prolonged immersion discolors violet flowers, and in all cases the blotting paper must be frequently renewed. The novelty appears to be the salicylic acid.

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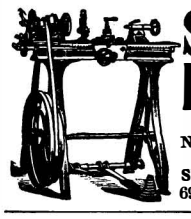

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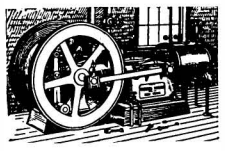

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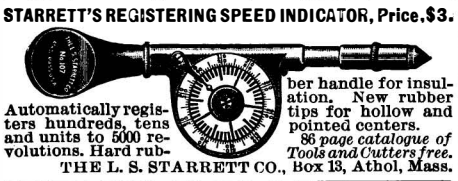

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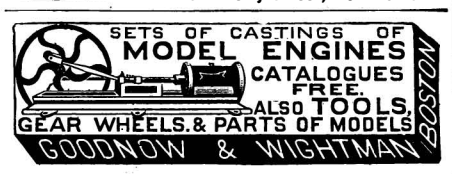

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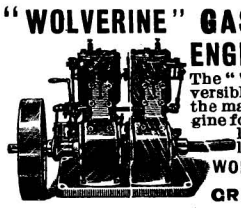

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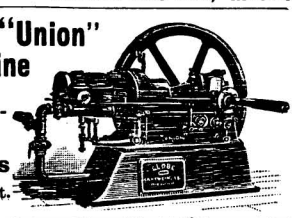

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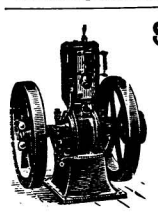

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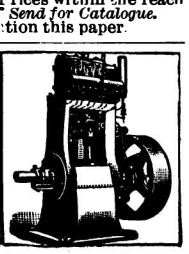

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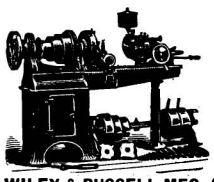

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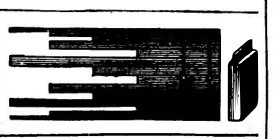

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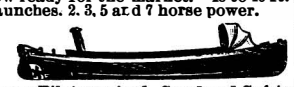

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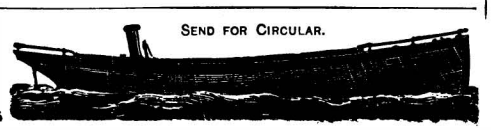

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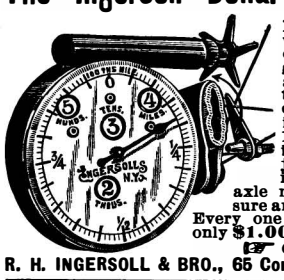

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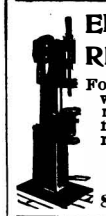

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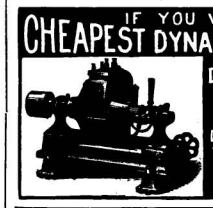

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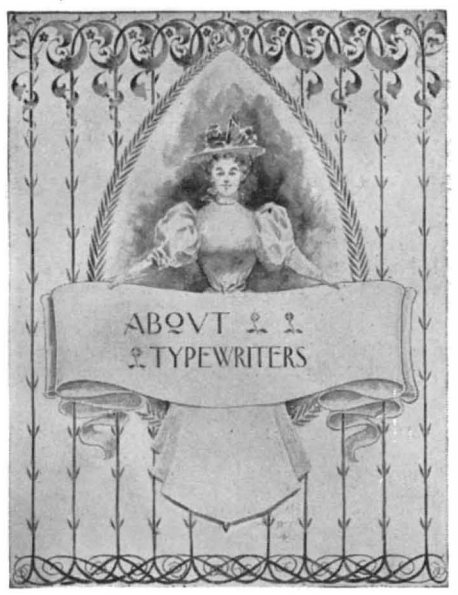

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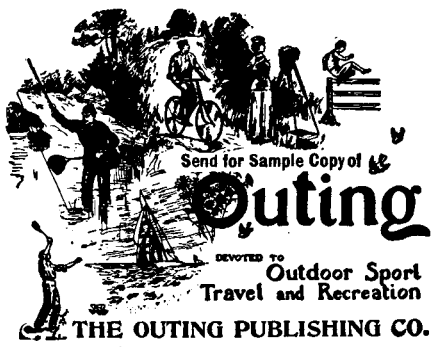

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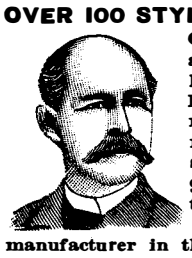

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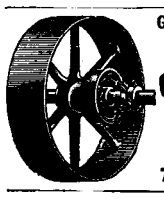

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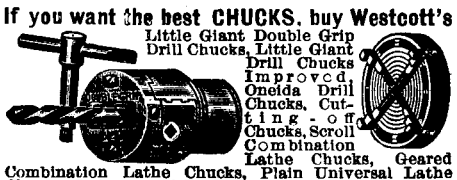

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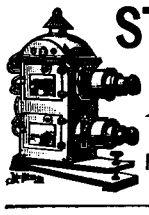

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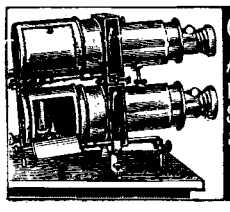

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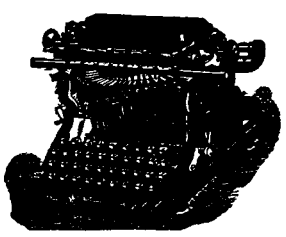

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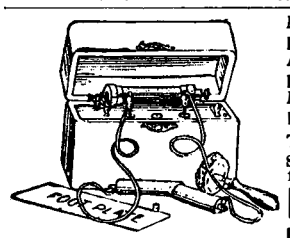

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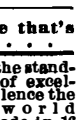

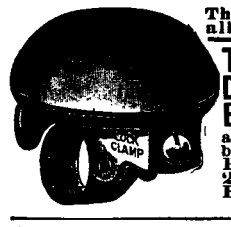

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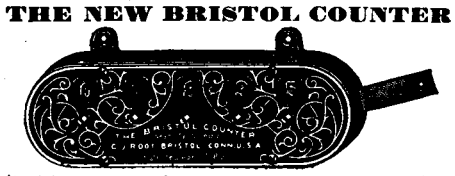

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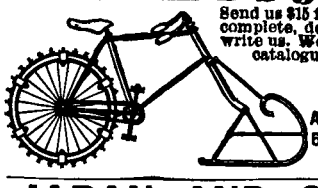

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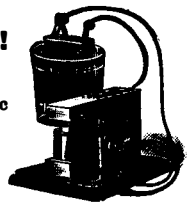

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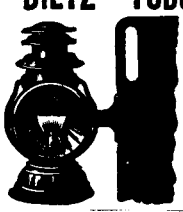

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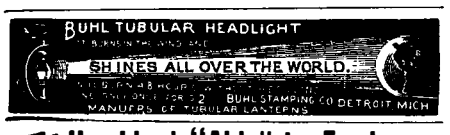

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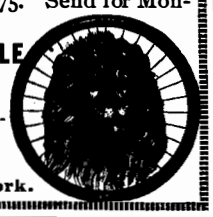

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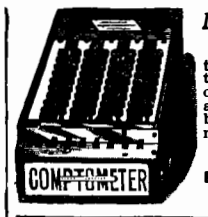

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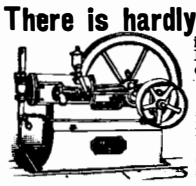

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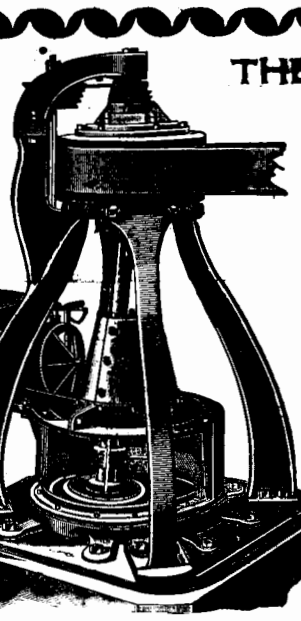

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